Anritsu

OPERATION MANUAL

DS-3 TRANSMISSION ANALYZER

ME462B

ANRITSU CORP.

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4.0 CALIBRATION PROCESS

4.1 EXTERNAL and INTERNAL CLOCK CHECK.

4.1.1 Connect UT (Unit to be calibrated) clock output to counter input through 75ohm termination.
Select 44.736M Hz as the clock on the UT.
Verify counter indicates 44.736M Hz +\- 447 Hz.

4.1.2 Connect the output of a signal generator to high impedance oscilloscope (use 50-75 adapter if signal generator is not 75ohm) and the UT external clock input.
Select external 1M-50M clock on UT.
Set the signal generator frequency to 1M Hz set level to 0 dbm. Decrease the output level until the counter begins to drift off the input frequency.
Verify the level is <= .7vp-p. Repeat at 50M Hz.

4.2 DS-3 OUTPUT CHECKS.

4.2.1 Set the UT to the following settings:

CLOCK	44.736M Hz
JITTER	OFF
PATTERN	1010
FRAME	OFF
ERROR ADDITION	OFF
OUTPUT LEVEL	HIGH

Connect DS-3 output #1 to the input of an oscilloscope terminated in 75ohm.
Verify the following:

AMPLITUDE	.798 to 1.021V
	-.798 to -1.021V
WIDTH	10.1 to 12.3n sec. (at half amplitude)
OVERSHOOT\UNDERSHOOT	< 10% of amplitude
RISE\FALL TIMES	3-6n sec

Repeat for DS-3 outputs 2 thru 6.

4.2.2 Set the UT output level to DS-3.
Verify the following:
AMPLITUDE +\- .430 - .550V
Repeat for DS-3 outputs 2 thru 6.

4.2.3 Set the UT output level to low.
Verify the following:
AMPLITUDE +\- 163mV - 209mV
Repeat for DS-3 output 2 thru 6.

4.3 DATA OUTPUT CHECKS.

4.3.1 Connect DATA OUTPUT #1 to oscilloscope through a 75ohm termination and verify the following.

LEVEL +\- 1V (+\- .1V)

Repeat for DATA OUTPUT #2 thru 6.

4.3.2 Connect the UT clock and data output to an oscilloscope through 75ohm termination. Trigger the oscilloscope on the clock input and set the time base to 2n sec\div. Verify the following:

4.4 JITTER CHECKS.

4.4.1 Remove bottom cover of UT and connect oscilloscope EXT TRIGGER to side of R62 closest to the front panel. Connect the UT CLOCK OUTPUT to the oscilloscope through 75ohm termination. Set the UT JITTER MODULATION to OFF.

4.4.2 Adjust the oscilloscope to display one CLOCK cycle over 10 horizontal divisions.
Set UT JITTER MODULATION to INT. Amplitude controls for an oscilloscope of .2 bits pk-pk jitter.
Verify the UT display indicates .09-.31 bits pk-pk.

4.4.3 Turn the UT JITTER MODULATION to OFF and adjust the oscilloscope for 4 complete clock cycles over 10 horizontal divisions. Set the UT JITTER MODULATION to INT and adjust the amplitude for an oscilloscope display of .5 bits pk-pk jitter.
Verify the display indicates .375-.625 bits pk-pk jitter.

4.4.4 Increase the UT amplitude until the display overlaps for the 1st time. Verify the UT display indicates .85-1.15 bits pk-pk jitter.

4.4.5 Increase the UT amplitude until the display overlaps for the 5th time. Verify the UT display indicates 4.65-5.35 bits pk-pk jitter.

4.4.6 Increase the Ut amplitude until the display overlaps for the 10th time. Verify the UT display indicates 9.4-10.6 bits pk-pk jitter.

4.4.7 Increase the UT amplitude until the display overlaps for the 15th time. Verify the UT display indicates 14.15-15.88 bits pk-pk jitter.

4.4.8 Set the UT JITTER MODULATION to EXT. Connect an Audio source to an oscilloscope through 75ohm termination. Set source for 1K Hz at 1Vp-p. Connect source to the UT JITTER MODULATION input. Verify the UT display indicates approx. 4 bits pk-pk jitter.

4.5 FUNCTIONAL CHECKS.

OPERATION MANUAL

DS-3 TRANSMISSION ANALYZER

ME462B

ANRITSU CORP.

1986.02 x 60 NIV-7(Y)
Printed in Japan

CERTIFICATION

Anritsu Electric Co., Ltd. certifies that this instrument has been thoroughly tested and inspected, and found to meet published specifications prior to shipping.
Anritsu further certifies that its calibration measurements are based on the Japanese Electrotechnical Laboratory and Radio Research Laboratory standards.

WARRANTY

All Anritsu products are warranted against defects in material and workmanship. The warranty is effective for one year from the date of delivery. In the event of improper use, abuse, or damage due to natural catastrophe, the warranty will become void. Anritsu will repair or replace products which prove to be defective during the warranty period, provided they are returned to Anritsu.
No other warranty is expressed or implied.
All requests for repairs and replacement parts should be directed to Anritsu or its representative in your area.

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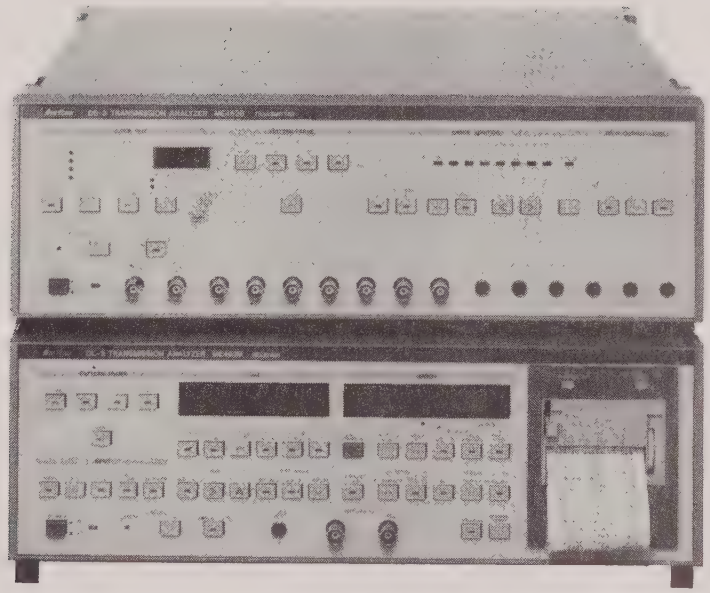

NOTICE

Anritsu changed its name from Anritsu Electric Co., Ltd., to ANRITSU CORP.

The new name is effective from October 1st 1985. Please change the old name to the new name in this manual.

CAUTION

Both the ME462B Transmitter and Receiver have battery backup for the memory. This allows measurement data or switch settings to be retained during ac power failures.

If the power supply has been off for a long period of time - about 45 days for both the transmitter and the receiver - the battery will be discharged. Should this occur, the memory will be erased and the instrument will return to the initial starting point. In that case, first turn on the power, and then recharge the battery for 12 hours.

N O T E

(1) The instrument is operable on a nominal voltage from 100 to 127 Vac or from 200 to 254 Vac by changing the connections of the power transformer taps.

The voltage and current rating are indicated on the rear panel when the instrument is shipped from the factory.

In the case of other voltage operation, change the connections of the power supply transformer, and the plate of voltage and current designations on the rear panel should be changed to suitable one.
Order the plates to Anritsu Electric Co., Ltd. if necessary.

(2) In this manual, a power supply voltage and current rating are represented by ** Vac, *** A, and [****] A.

(3) The relation between power supply voltage and current rating is listed below.

** Vac	(Transmitter) *** A	(Receiver) *** A
100 to 127 V	2 A	2 A
200 to 254 V	1 A	1 A

NOTE

When the printer is used, the recording paper must have been supplied before the power switch of the ME462B Receiver is turned ON.

If the recording paper is not supplied at this time, nothing is printed on the printer, because the ME462B Receiver judges that the printer is not incorporated.

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DS-3 TRANSMISSION ANALYZER ME462B

ME462B GP-IB INTERFACE (OPTION)

ME462B RS-232C INTERFACE (OPTION)

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SECTION 1

GENERAL

The ME462B DS-3 Transmission Analyzer is an error measurement equipment developed for testing and evaluating the performance of the DS-3 transmission terminal and link equipment.

The ME462B is used for the following items.

(1) Detection of bit errors, Parity errors and Bipolar violations.

(2) Measurement of Error Seconds, Error Free Seconds, Number of Total Errors and Error Rate.

The ME462B is consist of 2 components; Transmitter and Receiver. Being shown in the contents, Operation, Explanation of Functions and Measurement are described in this manual.

For ME462B maintenance, refer to the independent ME462B SERVICE MANUAL.

The ME462B GP-IB INTERFACE (optional) and The ME462B RS-232C INTERFACE (optional) are separately described.

SECTION 2

COMPOSITION AND SPECIFICATIONS

2.1 Composition

Table 2-1 ME462B Transmitter Standard Composition

Item	Name	Q'ty	Remarks
Equipment	ME462B Transmitter	1	
Accesso-ries	AC power cord	1	
	Fuse	3 sets	AC* A ..... of 6 DC 5 A ..... of 6 DC 1.6 A .... of 3 DC 1 A ..... of 6
	Operation manual	1	*1
	Service manual	1	*2

Table 2-2 ME462B Receiver Standard Composition

Item	Name	Q'ty	Remarks
Equipment	ME462B Receiver	1	
Accesso-ries	AC power cord	1	
	Fuse	3 sets	AC* A ..... of 6 DC 5 A ..... of 9 DC 1 A ..... of 6
	Operation manual	1	*1
	Service manual	1	*2

* : Refer to NOTE

*1 ; } The parts for the transmitter and for the receiver
*2 ; } are combined together in one book, respectively.

The ME462B Optional Functions are shown in Table 2-3.

Table 2-3 List of Options

Equipment	Description	Terms for the order
to Transmitter	One additional frequency to internal clock	[OPT 01] and [one frequency value] *3
	Two additional frequencies to internal clock	[OPT 02] and [two frequency value] *3
	Three additional frequencies to internal clock	[OPT 03] and [three frequency values] *3
	Four additional frequencies to internal clock	[OPT 04] and [four frequency values] *3
	GP-IB	[OPT 21]
	RS-232C	[OPT 22]
to Receiver	Built-in printer (Includes four rolls of Thermal paper, 2 rolls/pack)	[OPT 11]
	GP-IB	[OPT 31]
	RS-232C	[OPT 32]

*3 : The frequencies can be arbitrarily set in the range 6 MHz to 50 MHz

The ME462B Optional Accessories are shown in Table 2-4.

Table 2-4 Optional Accessories

Item	Description	Terms for the order
Connecting Cable	Special 3C-2W WECO 440A type — 2m — WECO 440A type	[Cable A] and [number of pieces]
	BNC, male — 3C-2V 2m — BNC, male	[Cable B] and [number of pieces]
	GP-IB, 2m	[Cable C] and [number of pieces]
	RS-232C, 2m	[Cable D] and [number of pieces]
	Special 3C-2W WECO 440A type — 2m — WECO 358 type	[Cable E] and [number of pieces]
Connector	WECO/BNC Coaxial adapter	[WECO/BNC Coaxial adapter] and [number of pieces]
Thermal Paper for printer *4	TP50KS-4F	[Printing Paper] and [number of rolls] *4
Portable Test Rack	Tilt angle type	[MB23A]
	Fixed horizontal type	[MB24A]
Carrying Case *5	Soft Pack type	[Case A] and [number of pieces]
	Protective type	[Case B] and [number of pieces]

*4 : Ten rolls. (2 rolls/pack)

*5 : One case can hold one transmitter or one receiver.

2.2 Specifications

2.2.1 ME462B Transmitter Specifications

Table 2-5 ME462B Transmitter Specifications

Item			Description
Clock	Internal	Frequency	44.736 MHz
		Additional Frequencies	Additionally any one to four frequencies from 6 MHz to 50 MHz (OPT 01 to OPT 04)
		Stability	Within ±10 ppm
	External	Frequency range	1 MHz to 50 MHz
		Input level	0.7 to 1.5 Vp-p
		Impedance	Nominal 75 Ω unbalanced to ground
		Connector	BNC female
	Jitter	Bit rate	44.736 Mbit/s (Modulation can only be applied when the clock is internal.)
		Frequency range	5 Hz to 1 MHz
		Amplitude	16.0 bits(p-p) max. Fig. 2-1(typical)
		Display	0.01 to 16.2 bits
		Accuracy	±5% ±0.1 bits
		Internal signal	Frequency: 2.3 kHz ±10% Amplitude: continuously adjustable in the range 0 to 16 bits(p-p)
		Sensitivity	Nominal 4 bits(p-p)/1 Vp-p (1 kHz)
		Impedance	Nominal 75 Ω unbalanced to ground
		Connector	BNC female
Pattern and Frame	Measuring Pattern	Pseudo-random	15 stages (32, 767 bits per word) Conforming to CCITT Rec. 0.151
		Fixed	1111, 1100, 1010
	Frame		With or without DS-3 framing by switch selection. When with framing, the standard Bell System DS-3 frame and control bits are added

Table 2-5 ME462B Transmitter Specifications (Cont'd)

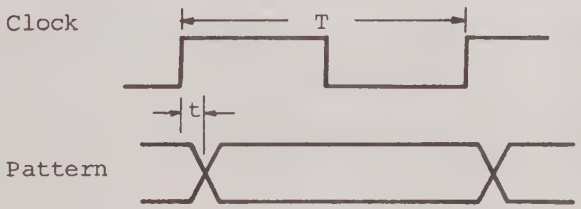
Item			Description
DS-3 OUTPUT	Code		BSZS
	High Level	Amplitude	0.91 Vo-p ±1 dB
		Width	11.2 ns ±1.1 ns (at half amplitude)
		Transition time	4.5 ns ±1.5 ns
		Overshoot/ undershoot	Less than 10% of pulse amplitude
	DS-3 LEVEL		High level signal as specified above passed through equivalent of 450 feet of 728A cable
	Low Level		High level signal as specified above passed through a 13.8 dB attenuator (0.186 Vo-p ±1 dB)
	Load		Nominal 75 Ω unbalanced to ground
	Output Number		6 ; 3 bits delayed for each of the six output phases, 1-6 in order
	Connector		Accepts a WECO 440A type plug
Unipolar Output Data and Clock	Format	Data	Binary NRZ (duty ; 95 to 105%)
		Clock	Square wave (duty ; 45 to 55%)
	Level		+1/-1 V ±0.1 V (0/+2.4 V or ECL is possible by changing the internal straps.)
	Phase		 T : period, $\|t\| < \frac{T}{10} + 1$ ns
	Load		Nominal 75 Ω unbalanced to ground
	Output Number	Data	6; The output phases 1-4 each delay the PRBS 1/4 word in order, and output phases 4-6 each delay 500 bits or more. However, with a fix pattern all are delayed 2 bits each in order.
		Clock	1
	Connector		BNC female

Table 2-5 ME462B Transmitter Specifications (Cont'd)

Item			Description
Error Addition	Internal	Errors	Bit errors, bipolar violations (PRBS pattern only). Bit errors will usually generate parity errors, since parity is calculated before the bit error addition. Bipolar violations are added so that false B3ZS pattern is not generated
		Rate	Error rates from 10^{-2} to 10^{-9} and single error
	External	Errors	Bit errors. Single or burst errors by switch selection
		Pulse width	More than 100 ns
		Interface	TTL
		Connector	BNC female
X-bit Input	It is possible to change with an external signal.		
	Interface		TTL (High : "1" Low : "0")
	Connector		BNC female
Sync. Output	Clock	Level	TTL
		Load	Nominal 75 Ω unbalanced to ground
		Connector	BNC female
	Pattern	Interface	TTL
		Connector	BNC female
	Multiframe	Interface	TTL
		Connector	BNC female
General	Power	AC	AC ** V -15/+10%, 50/60 Hz, ≦100 VA without other option, ≦110 VA with other option
		DC	-21.5 V to -53 V
	Dimensions		133 H, 426 W, 350 D mm
	Weight		≦12 kg with other option
	Ambient temperature, rated range in use		0 to 50°C

2.2.2 ME462B Receiver Specifications

Table 2-6 ME462B Receiver Specifications

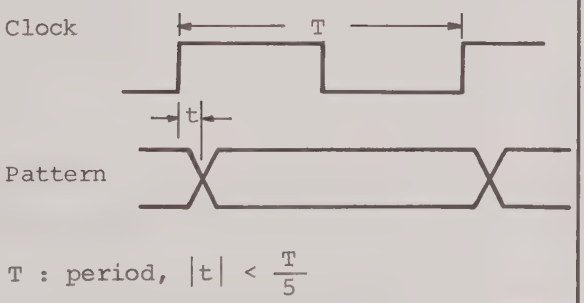
Item			Description
DS-3 Input	Frequency range		44.736 MHz ±50 ppM
	Code		B3ZS
	High Level	Amplitude	0.6 to 1.8 Vo-p
		Width	11.2 ns ±1.1 ns (at half amplitude)
		Transition time	4.5 ns ±1.5 ns
		Overshoot/ undershoot	≦10% (of pulse amplitude)
	DSX-3 Level		High level signal as specified above (level is 0.91 Vo-p ±1 dB) passed through equivalent of 450 to 900 feet of 728A cable
	Low Level		High level signal as specified above (level is 0.91 Vo-p) with 12 to 30 dB of attenuation
	DSX-3 Low Level		DSX-3 level signal as specified above (cable length is 450 feet) with 15 to 30 dB of attenuation
	Impedance		Nominal 75 Ω unbalanced to ground
	Connector		Accepts a WECO 440A type plug
Unipolar Input Data and Clock	Frequency range		1 MHz to 50 MHz
	Format	Data	Binary NRZ (duty ; 90 to 110%)
		Clock	Square wave (duty ; 45 to 55%)
	Level		+1/-1 ±0.1 V (0/+2.4 V or ECL is possible by changing the internal straps)
	Phase		 T : period, $\lvert t \rvert < \frac{T}{5}$
	Impedance		Nominal 75 Ω unbalanced to ground
	Connector		BNC female

Table 2-6 ME462B Receiver Specifications (Cont'd)

<table>
<tr><th colspan="3">Item</th><th>Description</th></tr>
<tr><td rowspan="3">Pattern and Frame</td><td rowspan="2">Measuring Pattern</td><td>Pseudo-random</td><td>15 stages (32,767 bits per word). Conforming to CCITT Rec. 0.151</td></tr>
<tr><td>Fixed</td><td>1111, 1100, 1010</td></tr>
<tr><td colspan="2">Frame</td><td>With or without DS-3 framing by switch selection</td></tr>
<tr><td rowspan="6">Error</td><td rowspan="4">Error Detection</td><td></td><td>Max. three error types are simultaneously detected.
One type of these is displayed by switch selection

Detected error;
<table>
<tr><th>Mode \ Rear panel display switch \ switch</th><th>0</th><th>1</th></tr>
<tr><td>IN SERVICE</td><td>Parity, Bip. V</td><td>Parity</td></tr>
<tr><td>OUT OF SERVICE</td><td>Bit, Parity, Bip. V</td><td>Bit</td></tr>
</table></td></tr>
<tr><td>Bit error</td><td>By comparing the input signal with the internally generated reference pattern</td></tr>
<tr><td>Parity error</td><td>By comparing the received parity bits in the control bits with the digital sum of the information bits in the previous frame</td></tr>
<tr><td>Bipolar violation</td><td>Two consecutive bipolar violations of the same polarity</td></tr>
<tr><td rowspan="2">Measuring item and range</td><td></td><td>Simultaneous measurement of four items, with one chosen for display via switch selection. Another switch allows measurement of error seconds or error free seconds to be set in synchronous or asynchronous modes.</td></tr>
<tr><td>Error seconds</td><td>It is possible to measure each of error seconds with error rates in excess of 10^{-3}, 10^{-4}, 10^{-5}, 10^{-6}, 10^{-7} and error rates less than 10^{-7} can be measured by using the built-in printer (optional).
Range : 0 to 9.9×10^{9}</td></tr>
</table>

Table 2-6 ME462B Receiver Specifications (Cont'd)

Item			Description
Error (Cont'd)	Measuring item and range (Cont'd)	Error free seconds (%)	It is possible to measure each of error free seconds with error rates in excess of 10^{-3}, 10^{-4}, 10^{-5}, 10^{-6}, 10^{-7} and error rates less than 10^{-7} can be measured by using the built-in printer (optional). Range : 0 to 100 (%)
		Total errors	Range : 0 to 9.9×10^{9}
		Error rate	Range : 9.9×10^{-2} to 1.0×10^{-15}
	Status Indicators	LED	No signal, DS-3 sync loss, Pattern sync loss, Blue signal, Errors, Gating, AC power fail
		Memory	Memory display and reset function in above condition (excluding errors and gating)
		Buzzer	Sounds are emitted when there is no signal, DS-3 sync loss, pattern sync loss, errors, blue signal. An ON/OFF control switch is available
Time	Measuring Time	Time	Max. 99 days : 23 hours : 59 minutes : 59 seconds
		Clock	10^{7} to 10^{12} bits
		Mode	Untimed or single or repeat mode by switch selection
		Display	The display of elapsed measuring time or remaining time are possible by Display switch selection. When being set by the clock, the measuring time is calculated from the frequencies of the input signal.
		Current data	It is possible to display current measuring data approximately every 1 second
	Real Time Clock	Display	year : month : day : hour : minute : second Real time clock is backed up by Ni-Cd rechargeable battery

Table 2-6 ME462B Receiver Specifications (Cont'd)

Item			Description
Error Output	Error		Bit errors, parity errors and bipolar violations are output separately
	Format		Binary RZ
	Level		TTL is "low" when there is no error, and "high" when there are any errors
	Load		Nominal 75 Ω unbalanced to ground
	Connector		BNC female
Sync Output	Clock	Level	TTL
		Load	Nominal 75 Ω unbalanced to ground
		Connector	BNC female
	Multiframe	Interface	TTL
		Connector	BNC female
	X-bits	Interface	TTL
		Connector	BNC female
	Alarm		Open : for normal Short (with Memory function) : for alarm occurrence
		Rated current	0.5 A
		Rated voltage	DC 100 V
Monitor Input			Using the optional built-in printer, the value of external applied voltage and level of status input can be printed together with the error rate. The rate of time that this voltage exceeds an externally adjustable reference voltage can also be printed.
	Voltage	Range	0 to ±20 V
		Accuracy	±(2% +0.1 V)
	Status	Interface	TTL

Table 2-6 ME462B Receiver Specifications (Cont'd)

Item			Description
General	Power	AC	AC ** V -15/+10%, 50/60 Hz, ≦90 VA without other option, 100 VA with other option
		DC	-21.5 V to -53 V
	Dimensions		133 H, 426 W, 350 D mm
	Weight		≦12 kg with other option
	Ambient temperature, rated range in use		0 to 50°C

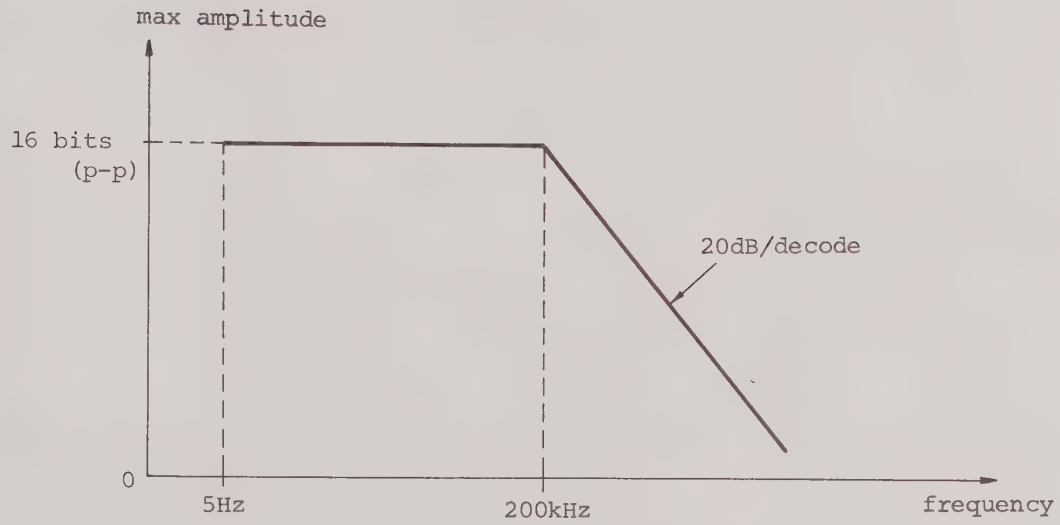


Fig. 2-1 Jitter Amplitude Characteristics

2.2.3 ME462B Options Specifications

Table 2-7 ME462B Options Specifications

	Item	Description	Specifications
TRANSMITTER	OPT 01	One additional frequency to internal clock from 6 MHz to 50 MHz	See the section on Clock in 2.2.1 ME462B TRANSMITTER Specifications
	OPT 02	Two additional frequencies to internal clock from 6 MHz to 50 MHz	
	OPT 03	Three additional frequencies to internal clock from 6 MHz to 50 MHz	
	OPT 04	Four additional frequencies to internal clock from 6 MHz to 50 MHz	
	OPT 21	GP-IB (IEEE Std. 488-1978) Can control all items which are set by switches except the power and panel lock switches. Can output the jitter amplitude	Refer to the OPERATION MANUAL for GP-IB and RS232 (optional) INTERFACE of ME462B
RECEIVER	OPT 31		
TRANSMITTER	OPT 22	RS-232C. Same as for GP-IB	
RECEIVER	OPT 32		
	OPT 11	Built-in thermal printer. Print out of measured results and details of analysis	See Table 2-8.

Table 2-8 ME462B Printer Specifications

Item	Description
Number of characters	20 characters/line
Printing speed	approximately 3 lines/sec
Print system	thermal perceive
Print data	Time, measuring data, analysis data
Printing	NORMAL/INVERTED selection by switch
Weight	≦1.5 kg
Ambient temperature, rated range in use	0 to 50°C

SECTION 3

OPERATION

3.1 Operation Description of ME462B

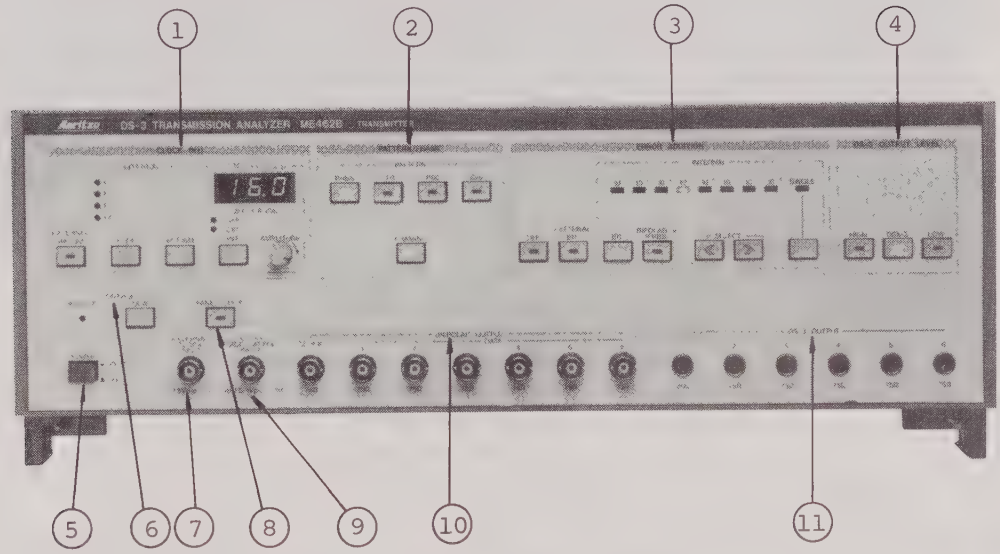


Fig. 3-1 Transmitter Front Panel

Table 3-1 Transmitter Front Panel

No.	Marking	Explanation	Section No. for reference
(1)	CLOCK	• Selects clock frequencies and switches jitter modulation. • When [EXT] or [INT] in jitter modulation is pressed, the modulation amplitude is displayed by a 3-digit LED. • When [INT] is selected, amplitude can be adjusted 0 to 16 bits continuously with knob.	4.1.1
(2)	PATTERN/ FRAME	Selects the output pattern and switches with or without framing	4.1.2
(3)	ERROR ADDITION	Selects the kinds of error and error rates	4.1.3
(4)	DS-3 OUTPUT LEVEL	Selects the level of the DS-3 OUTPUT (11)	4.1.4
(5)	POWER	Power switch	-

Table 3-1 Transmitter Front Panel (Cont'd)

No.	Marking	Explanation	Section No. for reference
⑥	REMOTE	The [REMOTE] lamp is on when controlled externally by GP-IB or RS-232C. The [LOCAL] switch is used to restore the external control state to local state	-
⑦	EXTERNAL CLOCK INPUT	Input connector for external clock signal	4.1.1
⑧	PANEL LOCK	When this switch is pressed (turned on), all switches except the [POWER] switch ⑤ on the front panel are disabled in order to prevent switch operations due to incorrect connections	-
⑨	JITTER MODULATION INPUT	Input connector for external jitter modulation signal	4.1.1
⑩	UNIPOLAR OUTPUT CLOCK DATA	Output connector for unipolar signal Clock Data (6 systems)	4.1.5
⑪	DS-3 OUTPUT	Output connector for DS-3 signal (6 systems)	4.1.4

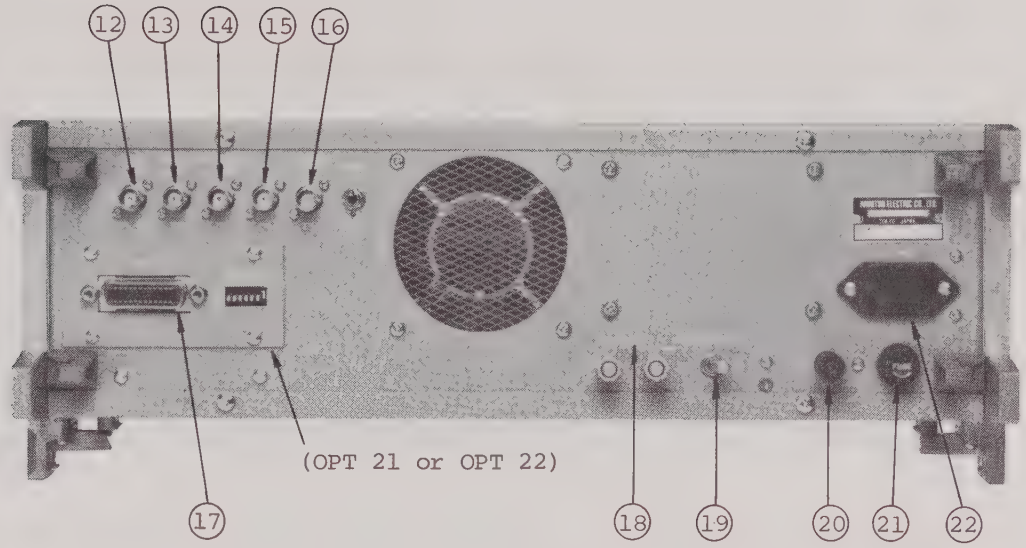


Fig. 3-2 Transmitter Rear Panel

Table 3-2 Transmitter Rear Panel

No.	Marking	Explanation	Section No. for reference
⑫	CLOCK SYNC OUTPUT	• Output connector for clock sync signal. • When jitter modulation (1) is [EXT] or [INT], a clock is issued as the sync signal, which does not jitter modulation.	-
⑬	PATTERN SYNC OUTPUT	Output connector for pattern sync signal	4.1.2
⑭	MULTIFRAME SYNC OUTPUT	Output connector for Multiframe sync signal	4.1.2
⑮	X-BIT INPUT	• Input connector for X-bits signal • An external signal can change the X-bits of DS-3 framing to 1 or 0	4.1.2
⑯	EXTERNAL ERROR INPUT SINGLE BURST	• Input connector for external error signal • Single or burst error can be switched	4.1.3
⑰	GP-IB ADDRESS (optional)	• GP-IB connector and address switch • Provided when OPT 21 is installed • RS-232C is mounted here instead of GP-IB when OPT 22 is installed	OPERATION MANUAL of GP-IB and RS-232C

Table 3-2 Transmitter Rear Panel (Cont'd)

No.	Marking	Explanation	Section No. for reference
(18)	DC INPUT	• Terminal for DC power supply • This is used when the station battery is used instead of the AC power source	3.2.1
(19)	AC DC	Switch for selecting AC or DC power supply	3.2.1
(20)	⏚	This grounding terminal protects the user from electric shock	3.2.1
(21)	FUSE *A	Fuse holder with primary *A AC fuse built in	-
(22)	AC **V	AC inlet	-

*, **: Refer to NOTE.

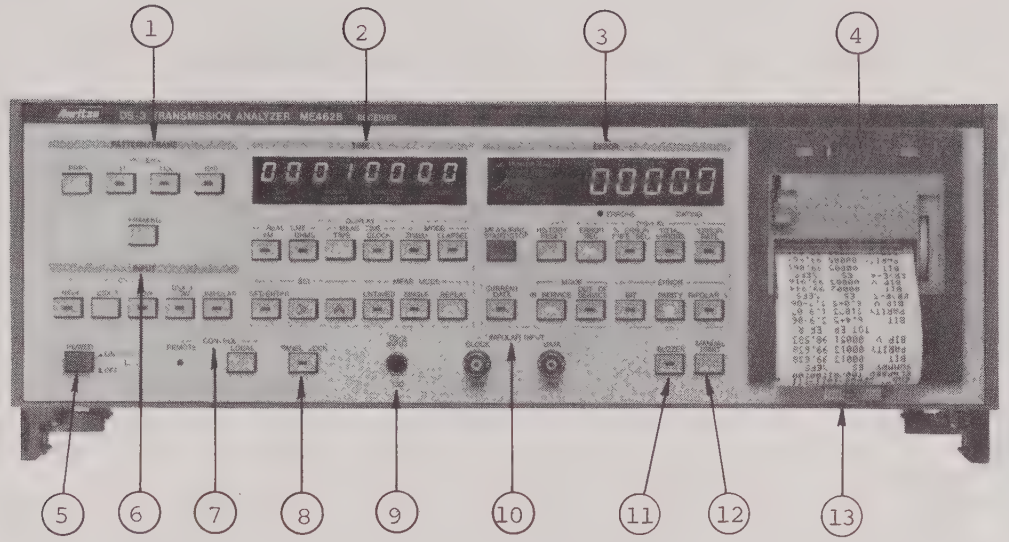


Fig. 3-3 Receiver Front Panel

Table 3-3 Receiver Front Panel

No.	Marking	Explanation	Section No. for reference
(1)	PATTERN/ FRAME	Selects the pattern matched to the input pattern and determines whether it is provided with or without framing	4.2.2
(2)	TIME	Displays and sets the measuring time and real time clock	4.2.3
(3)	ERROR	Displays the measured results and sets the measuring mode	4.2.4
(4)	PRINTER (OPTION)	The printer is installed by OPT 11. Prints the measured results	4.2.5
(5)	POWER	Power switch	-
(6)	INPUT	Switches the DS-3 input signal or unipolar input signal, and selects the input level in the case of DS-3 input	4.2.1
(7)	REMOTE	• The [REMOTE] lamp turns on when it is controlled externally by GP-IB or RS-232C • The [LOCAL] switch is used to restore the external control state to local state	-

Table 3-3 Receiver Front Panel (Cont'd)

No.	Marking	Explanation	Section No. for reference
⑧	PANEL LOCK	When this switch is on, all switches except the [POWER] switch ⑤ on the front panel are disabled, in order to prevent the switch from being switched due to incorrect connections	-
⑨	DS-3 INPUT	DS-3 signal input connector	4.2.1
⑩	UNIPOLAR INPUT	• Unipolar signal input connector • Used for clock and data signal	4.2.1
⑪	BUZZER	If this switch is kept on, error and alarm states are indicated by an audible alarm	4.2.4
⑫	MANUAL PRINT	When this switch is pressed, intermediate data is printed out	4.2.5
⑬	EJECT	Pushing this knob unlocks the optional printer, which comes forward a little	-

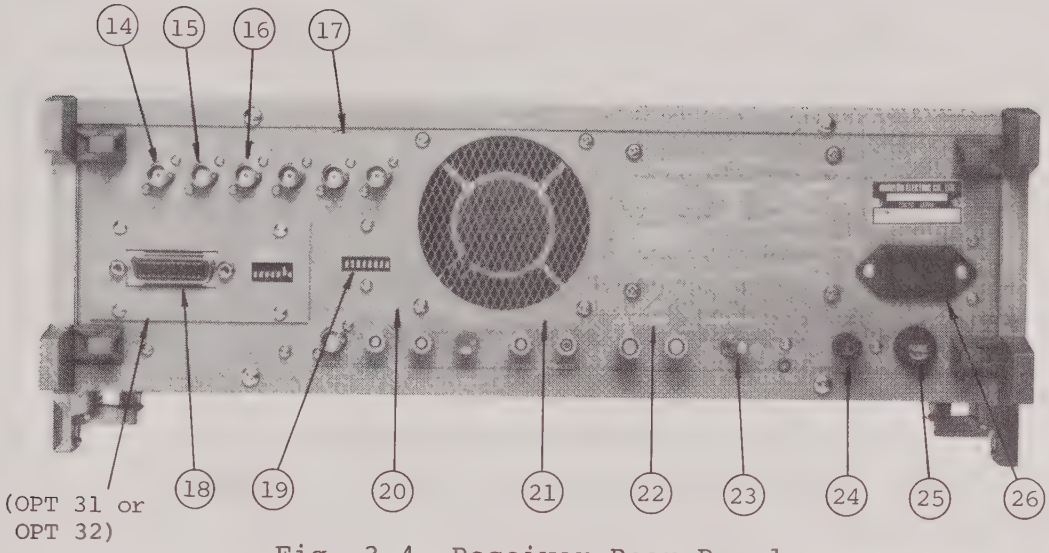


Fig. 3-4 Receiver Rear Panel

Table 3-4 Receiver Rear Panel

No.	Marking	Explanation	Section No. for reference
⑭	CLOCK SYNC OUTPUT	Output connector for clock sync signal	-
⑮	MULTIFRAME SYNC OUTPUT	Multiframe sync signal output connector	4.2.2
⑯	X-BIT OUTPUT	• X-bits signal output connector. • Only X-bits of DS-3 framing are output	4.2.2
⑰	ERROR OUTPUT • BIT • PARITY • BIPOLAR VIOLATION	• Error signal output connector. • Bit error, parity error, and bipolar violation	-
⑱	GP-IB ADDRESS (optional)	• GP-IB connector and address switch. • Provided when OPT 31 is installed. • RS-232C is mounted here instead of GP-IB when OPT 32 is installed	OPERATION MANUAL of GP-IB and RS-232C

Table 3-4 Receiver Rear Panel (Cont'd)

No.	Marking	Explanation	Section No. for reference
⑲	FUNCTION SWITCH	Additional function setting switch. This switch setting is entered only when the POWER SWITCH (1) is ON.	4.2.4 4.2.5
⑳	MONITOR INPUT	• Prints the applied voltage and level of status input at the printer. • Only when the printer (OPT 11) is self-contained	4.2.4 4.2.5
㉑	ALARM OUTPUT	• Both terminals are short circuited in an alarm state. • And open in normal state	4.2.4
㉒	DC INPUT	• Terminal for DC power supply • This is used when the station battery is used instead of the AC power source	3.2.1
㉓	AC DC	Switch for selecting AC or DC power supply	3.2.1
㉔	⏚	This grounding terminal protects the user from electric shock	3.2.1
㉕	FUSE *A	Fuse holder with primary *A AC fuse built in	-
㉖	AC **V	AC inlet	-

*, **: Refer to NOTE

3.2 Precautions Before Operation

3.2.1 Power source

The ME462B normally operates on AC **V ±10%, 50/60 Hz.

** Refer to NOTE

WARNING

1. Be sure to ground the ⏚ terminal on the rear panel of the unit or the ground terminal of the power supply cord to avoid electrical shocks.
2. Make sure the power switch is [OFF] and the power supply cord unplugged whenever replacing fuses.

The ME462B can also be operated with a DC power supply. For this purpose, set the AC/DC switch on the rear panel to DC side and connect to a 24-48V DC power device, and then turn the ME462B power switch on the front panel.

WARNING

Never change the AC/DC switch on the rear panel during power is ON.

3.2.2 Environmental conditions of the installation site

The ME462B operates normally at an ambient temperature from 0 to 50°C. It should not, however, be used in any of the following locations:

1. Locations subject to strong vibrations
2. Damp or dusty areas
3. Locations exposed to direct sunlight.
4. Locations which might be exposed to active gases.

CAUTION

If the ME462B is used at standard room temperature after having been used or stored at temperatures as low as 0°C for an extended period, condensation may cause it to short circuit. Be sure that the ME462B is free from condensation before turning the power on.

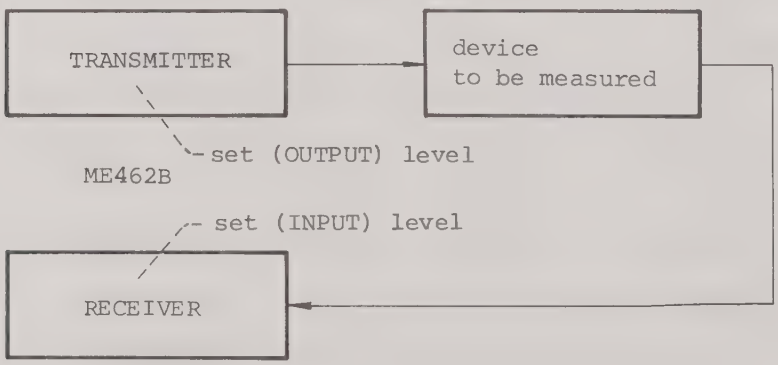
3.2.3 Termination and maximum input signal level

Do not terminate output by a method other than the one given in SECTION 2, Specifications.

Also, do not apply a signal having a level higher than the one specified. If these restrictions are not observed the internal circuitry may be damaged.

3.2.4 Connection between device to be measured and the ME462B

The connection between the equipment to be measured, the ME462B TRANSMITTER and RECEIVER should be taken care after the output level of the TRANSMITTER and the input level of the RECEIVER have been set to the input and output levels of the equipment. Otherwise, the internal circuitry of the equipment or of the ME462B may be damaged.



3.3 Measurement

3.3.1 Self-Check of the Instrument

The ME462B TRANSMITTER and RECEIVER are available to self-check measurement by each other.

Most fundamental measurement by using DS-3 signal is described first. Other measurements are described in section 3.3.1(4).

(1) Switch settings

Before the connection of the TRANSMITTER and RECEIVER, must be set as Table 3-5. (The numbers in the table 3-5 refer to Fig. 3-5.)

Switches with LED are ON when LED is turned on, and OFF when LED is turned off.

Table 3-5 Setting States of the Switches

	No.	Marking	Setting	Remarks
TRANSMITTER	①	POWER	ON	Besides all the lamps light for about 2 seconds after this switch turned ON.
	②	PANEL LOCK	OFF	When this switch is ON, all other switches except the [POWER] switch ① are not effective.
	③	CLOCK INTERNAL .... MODULATION ..	 44.736 M OFF	
	④	PATTERN/FRAME PATTERN ..... FRAMING	 PRBS ON	
	⑤	ERROR ADDITION	OFF	
	⑥	DS-3 OUTPUT LEVEL	DSX-3	

Table 3-5 Setting States of the Switches (Cont'd)

	No.	Marking	Setting	Remarks
RECEIVER	⑦	POWER	ON	Besides all the lamps light for about 2 seconds after this switch turned ON. The buzzer also sounds simultaneously for about 2 seconds.
	⑧	PANEL LOCK	OFF	When this switch in ON, all other switches except the [POWER] switch ① are not effective.
	⑨	BUZZER	OFF	
	⑩	INPUT	DSX-3	
	⑪	PATTERN/FRAME PATTERN ..... FRAMING	 PRBS ON	
	⑫	TIME MEAS TIME ... (display) ... MEAS MODE ...	 TIME (00 00 00 10) SINGLE	Measuring time may set to 10 seconds for example. a: [SET/ENTER] ON b: [TIME] ON of MEAS TIME c: Set time by using [≫], [∧]. d: [SET/ENTER] OFF
	⑬	ERROR DISPLAY ..... MODE ..... ERROR ..... CURRENT DATA	 ERROR SECS OUT OF SERVICE BIT OFF	
	⑭	(PRINTER)	OFF	Printer is optional (refer to section 4.2.5)

(2) Connection

After the setting by (1) Switch setting, connect the Transmitter and the Receiver by Fig. 3-5.

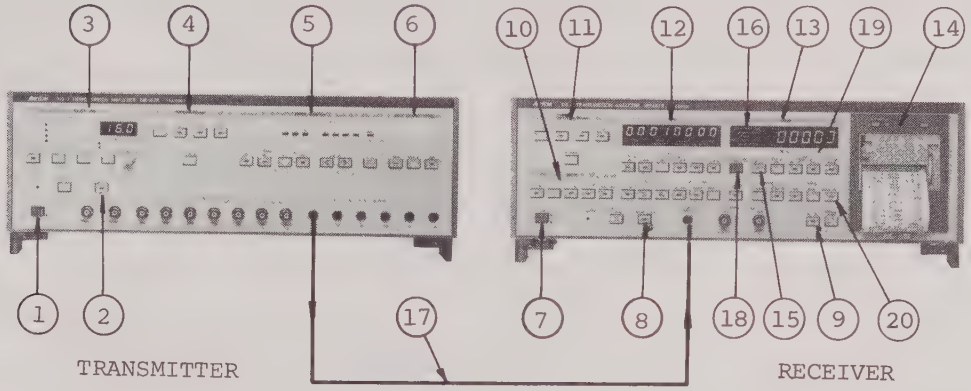


Fig. 3-5 Layout of Controls and Connection

(3) Display

After the setting the state by (1) and (2), successive steps are as follows.

Push [HISTORY RESET] switch (15).
Confirm that, when just after this procedure, all alarm lamps (LED) (16) are go out. All check for the alarm lamps are done by Table 3-6.

Alarm lamps which are red coloured are turned on only for alarm occurrence.

Ones which are amber coloured are remain turning on after alarm go out, so after completion of self-check, they must be turned off by [HISTORY RESET] switch (15).

Table 3-6 Check Procedure for the Receiver Alarm Lamps

Alarm lamps in (16)	turn	Description
AC POWER FAIL	ON	Turn [POWER] switch (7) on and keeping it, take off the AC line cord. This lamp is turned on when the AC line cord is reconnected.
SIGNAL LOSS	ON	Disconnect the cable (17)
FRAME LOSS	ON	Turn the [FRAMING] switch in (4) of the Transmitter to OFF
PATT SYNC LOSS	ON	Set the [PATTERN] switch (4) of the Transmitter to 1100
BLUE SIGNAL	ON	Set the [FRAMING] switch (4) to ON, Set the [PATTERN] switch in (4) of the Transmitter to 1010

[MEASURING START/STOP] switch (18) starts the measuring operation. The measuring start/stop operations can be excuted by repeatedly pressing this switch. The GATING lamp (19) lights up within 1 second after this switch is turned ON.

Table 3-7 shows the display example of Measured result. In the table, the display example in that case addition of errors is performed in Transmitter are also shown.

The display shows [-----] for about 10 seconds just after the [MEASURING START/STOP] switch (18) is pressed. Then the values shown in Table 3-7 appear. Although only one value is displayed, all the other values can be checked by selecting the required values using the [DISPLAY] switch (19) and the [ERROR] switch (20).

Table 3-7 Display Example of Measured Result

DISPLAY (19)	ERROR (20)	Display		
		Setting for [ERROR ADDITION] switch (5) of Transmitter		
		OFF	for BIT, 10^{-8}	for BIPOLAR, 10^{-8}
ERROR SECONDS	BIT PARITY	00000	00004 or 00005	00000
	BIPOLAR V.		00000	00004 or 00005
ERROR FREE SECONDS	BIT PARITY	100	50.000 or 60.000	100
	BIPOLAR V.		100	50.000 or 60.000
TOTAL ERRORS	BIT PARITY	00000	00004 or 00005	00000
	BIPOLAR V.		00000	00004 or 00005
ERROR RATE	BIT PARITY	0.0×10^{-9}	8.9×10^{-9} to 1.1×10^{-8}	0.0×10^{-9}
	BIPOLAR V.		0.0×10^{-9}	8.8×10^{-9} to 1.1×10^{-8}

(4) Settings for furthermore measurements

Table 3-8 is useful for adding other test items to the setting in (1) and for changing to other measurement.

Table 3-8 Measurement Examples

Measurement item	Measuring steps and switch settings		Details to be referred
	Transmitter	Receiver	
Provide clock from external	1) Set CLOCK switch in (3) to [EXTERNAL]. 2) Feed external clock to [EXTERNAL CLOCK INPUT] connector	———	———
Change the Measurement Pattern or turn FRAMING to OFF	[PATTERN/ FRAME] (4)	[PATTERN/ FRAME] (11)	4.1.2 4.2.2
Adding errors to output pattern.	1) [INTERNAL] of ERROR ADDITION (5) is used, for the case of internal error 2) Change to [EXTERNAL] of ERROR ADDITION (5) and feed error signal from the rear connector (the switch (16) in Fig. 3-2)	———	4.1.3
Change DS-3 output or DS-3 input level	[DS-3 Output LEVEL] (6)	[INPUT] (10)	4.1.4 4.2.1
Change Measuring time	———	Use [MEAS TIME] and [SET] of TIME (12)	4.2.3
Change Real time clock	———	Use [REAL TIME] and [SET] of TIME (12).	4.2.3

3.3.2 Measurement at the DSX-3 Cross - Connect Point

(1) Switch setting

Switch settings are the same as section 3.3.1.(1) except measuring time, which may be changed by the cases.

(2) Connections

After the setting the switches, connect each equipments as follows Fig. 3-6.

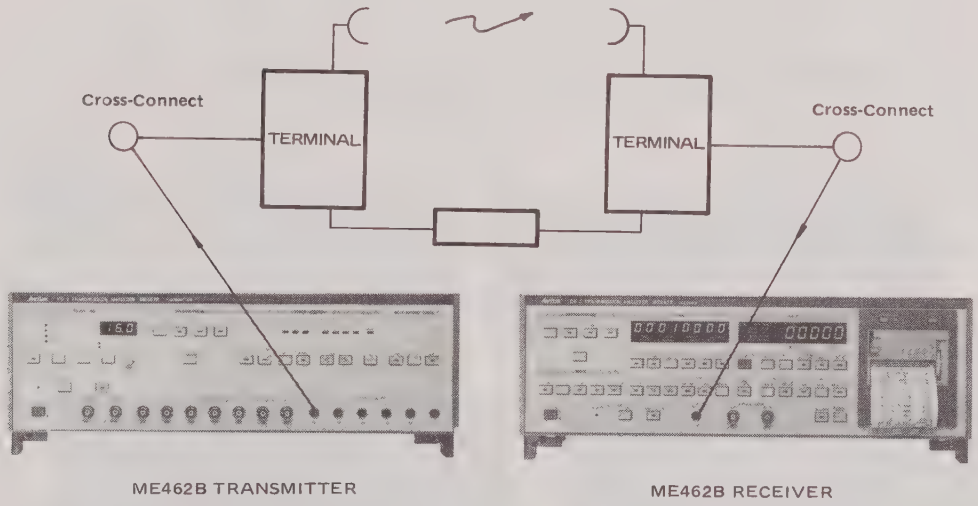


Fig. 3-6 Measurement at DSX-3 Cross - Connect point

(3) Display

The Measured results are displayed after starting measurement by pushing the [MEASURING START/STOP] switch (18) and after the measuring time pass.

3.3.3 Measurement Using Unipolar Signal

(1) Switch setting

Almost the same as Table 3-5 in section 3.3.1 (1). Except for the following:

- Need not set [DS-3 OUTPUT LEVEL] switch (6).

- Must be set [UNIPOLAR] instead of [DSX-3] switch (10).
- Measuring time may be changed by the cases.
- Input/output levels can be also changed from standard level +1/-1 V to 0/+2.4 V or ECL by changing the connection, which is described in section 3.4 (Internal Switch Setting).

(2) After switch setting, connect as Fig. 3-7. (16 QAM System is shown as example)

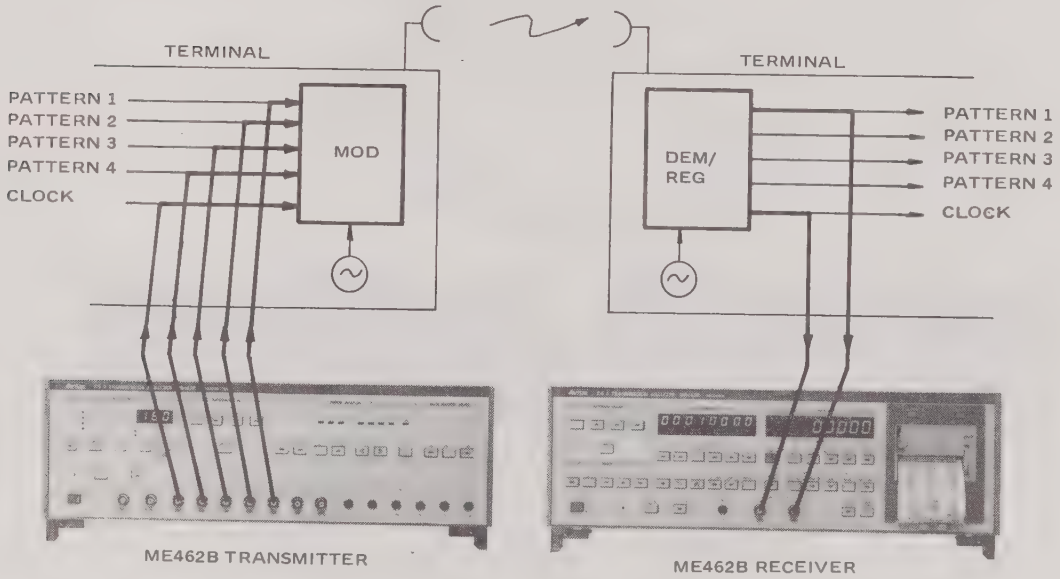


Fig. 3-7 Measurement Using Unipolar Signal

(3) Display

The measured results are displayed after starting measurement by pushing the [MEASURING START/STOP] switch (18) and after the measuring time pass.

3.3.4 Jitter Immunity Measurement

(1) Switch setting

Almost the same as Table 3-5 in section 3.3.1.(1). Except for the following:

- Change MODULATION switch in CLOCK (3) to [EXT].
- Change DISPLAY switch (19) in ERROR (13) to [ERROR RATE].

(2) Connections

After the setting the switches, connect each equipment as follows Fig. 3-8.

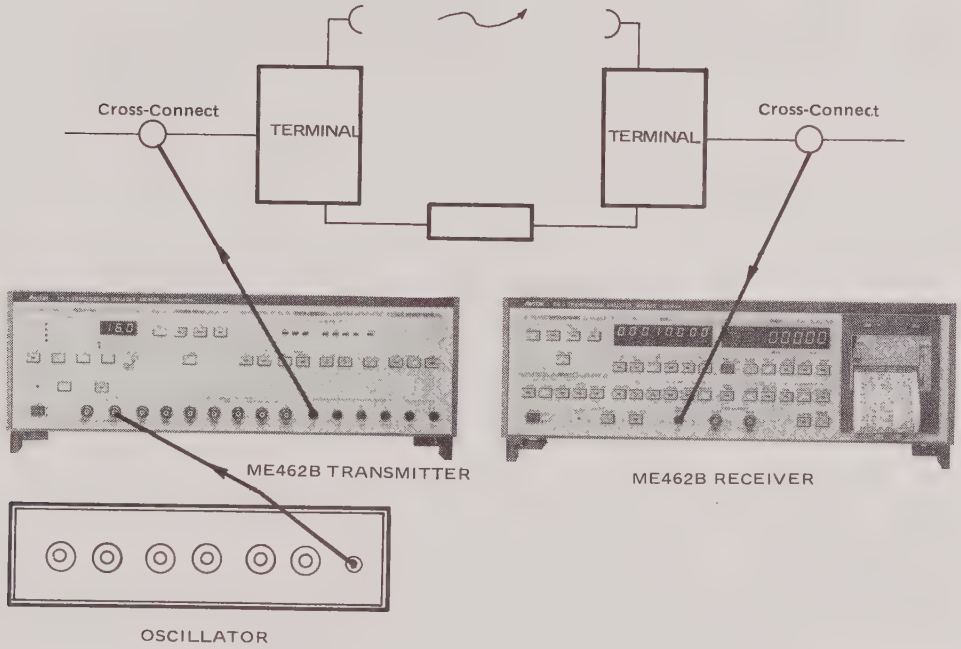


Fig. 3-8 Jitter Immunity Measurement

(3) Measurement

The jitter amplitude applied to output pattern is displayed in 3 digit LED.

The jitter amplitude is proportional to the output level of the oscillator (4 bit(p-p)/1 Vp-p), and the jitter frequency corresponds to the oscillator's frequency.

By the connections shown in Fig. 3-8, the jitter amplitude frequency/Error Rate characteristics can be measured. The external oscillator is not required

for simple jitter immunity measurement. It can be done easily using the ME462B only. For this type of measurement set the transmitter MODULATION switch in CLOCK (4) to [INT]. The jitter frequency is fixed to 2.3 kHz. The jitter amplitude can be adjusted by the knob in the range from 0 to 16 bit (p-p).

3.4 Internal Switch Settings

Turn OFF the POWER SWITCH prior to altering the following settings.

3.4.1 Transmitter

The output level can be changed by changing the connection of each connectors as shown in Table 3-9.

Even if the number of DATA output routes are less than 6, all the connectors must be altered as shown in Table 3-9.

Table 3-9 Output Level Changing

Connector	Pin No. to be connected		
	Output level		
	+1/-1 V*	0/+2.4 V	ECL
J21 to J27	2-3	2-3	1-2
J51	1-2	2-3	1-2 or 2-3
J35	1-2	2-3	1-2 or 2-3

* Set to this state for shipping.

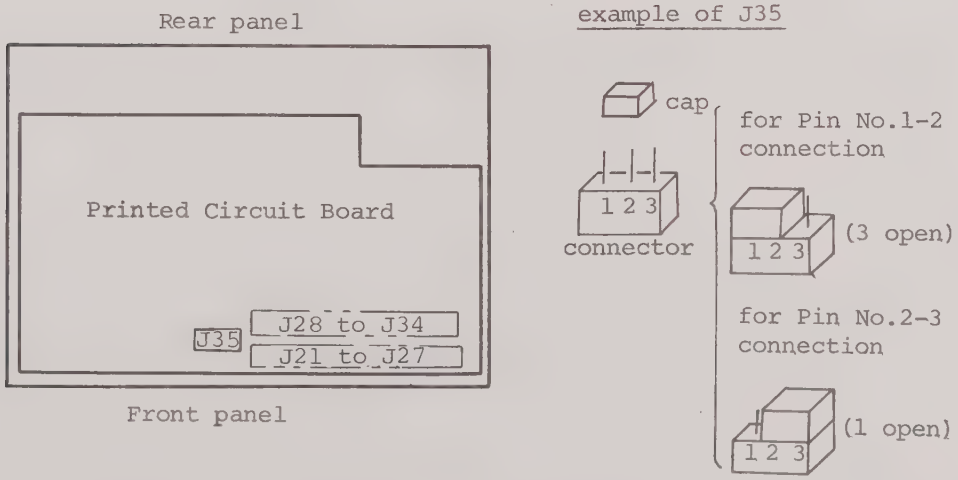


Fig. 3-9 Layout of Transmitter Connectors (Viewed from bottom)

3.4.2 Receiver

(1) Input level changing

The input level can be changed by changing the connection of each connectors as shown in Table 3-10.

Table 3-10 Input Level Changing

Connector	Pin No. to be connected		
	Input level		
	+1/-1 V*	0/+2.4 V	ECL
J7 to J9	2-3	2-3	1-2
J10, J11	2-3	1-2	2-3

* Set to this state for shipping.

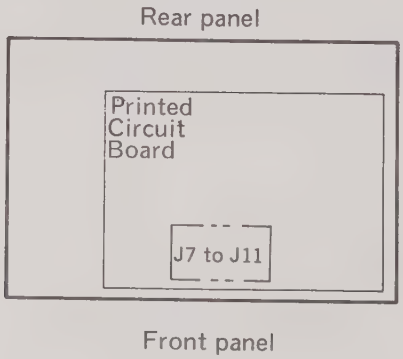


Fig. 3-10 Layout of Receiver Connectors
(Viewed from bottom)

(2) Other function

Switch S1 in Fig. 3-11 allows the functions to be expanded as shown in Table 3-11.

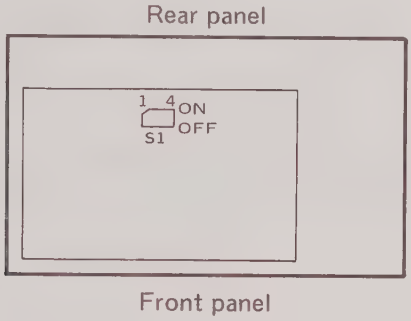


Fig. 3-11 Layout of Receiver Switch
(Viewed from upside)

Table 3-11 Switch Setting

Pin Number of S1	State of S1		Remarks
	OFF*	ON	
S1-1	Reserved		
S1-2	Printer form not saved	Printer form saved	In a serial print operation, this function enables to stop printing as required to economize on forms. See section 4.2.5(4).
S1-3	Adjacent errors are counted in case of Signal loss or Frame loss.	Errors within about one second of Signal loss or Frame loss are not counted.	
S1-4	Reserved		

* Set to this state for shipping.

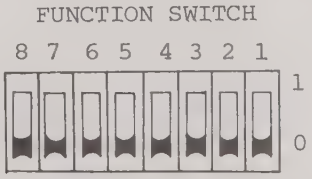
(3) Additional functions (DIP switch on the rear panel)

The following table shows functions available by setting the DIP switch on the rear panel:

Table 3-12 Additional Function

NO.	FUNCTION SWITCH 0*	FUNCTION SWITCH 1	ITEMS		DETAILS
1	SYNCHRONOUS	ASYNCHRONOUS	ERROR SECONDS		4.2.4(2)
2	PARITY.BIPOLAR V	PARITY	IN SERVICE	ERROR	4.2.4(1)
	BIT.PARITY.BIPOLAR V	BIT	OUT OF SERVICE		
3	ABCD	ABCD	FORMAT	PRINTER	4.2.5
4	COMPLETE	SHORT	DATA LENGTH		4.2.5(2)
5, 6	6 5		THRESHOLD FOR PRINTING		4.2.5(4)
	0 0	ERROR PULSES ≧ 1			
	0 1	ERROR RATE > 10^{-3}			
	1 0	NOT PRINTED			
	1 1				
7	OFF	ON	MONITOR INPUT		4.2.4(5) 4.2.5(4)(5)
8	MIN VOLTAGE	MAX VOLTAGE			

* Set to this state for shipping.



SECTION 4

EXPLANATION OF FUNCTIONS

4.1 Transmitter

4.1.1 Clock and jitter

The bit rate of an output pattern and whether or not jitter modulation is applied to an output pattern are determined.

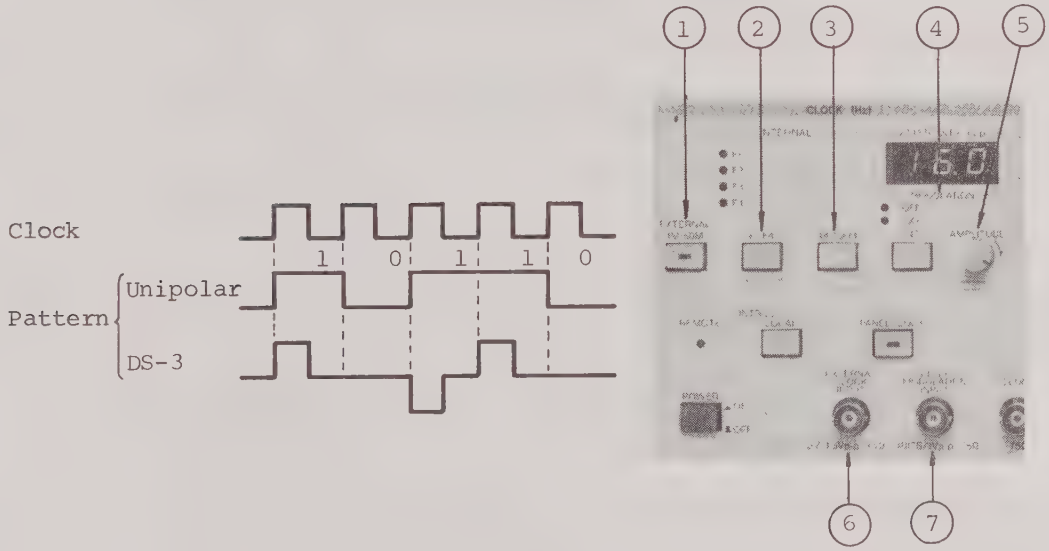


Fig. 4-1 Chart of Clock and Pattern

Table 4-1 Explanation of CLOCK Function in Transmitter

No.	Marking	Description
(1)	EXTERNAL	When clocks are externally supplied, this switch is turned on and a signal is applied to EXTERNAL CLOCK INPUT (6).
(2)	F1 - F4	These are the frequencies being measured with the unipolar interface. If OPT 01 to OPT 04 are not installed, pressing this switch will not turn lamps F1 to F4 on.

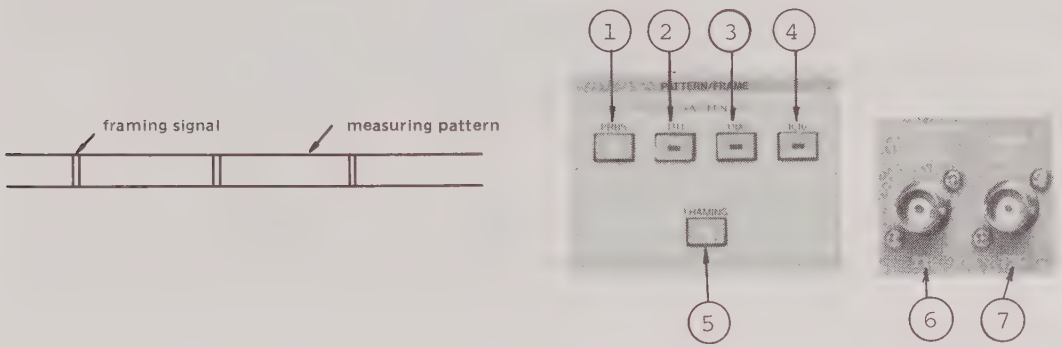
Table 4-1 Explanation of CLOCK Function in Transmitter (Cont'd)

No.	Marking	Description
③	44.736M	DS-3 SYSTEM frequency
④	MODULATION	• When applying jitter modulation to an output pattern, CLOCK must be set at [44.736 MHz] in INTERNAL and MODULATION switch must be set at [EXT] or [INT]. • In the case of [EXT], it is necessary to apply a modulation signal to [JITTER MODULATION INPUT] ⑦. The jitter frequency coincides with the modulation signal frequency and the jitter amplitude is proportional to the modulation signal level. (Example: an input level of 1 Vp-p corresponds to a jitter amplitude of 4 bits (p-p).) • In the case of [INT], modulation signal is built-in. Jitter frequency is fixed at 2.3 kHz. Jitter amplitude can be adjusted by the knob in the range from 0 to 16 bits (p-p). • The jitter amplitude is displayed by LED so that 0.01 bits p-p steps are used for less than 10 bit (p-p) and 0.1 bits (p-p) steps for 10 to 16 bits (p-p).

Operation: If the [F1 - F2] switch ② is pressed, F1 lamp will turn on and after this, each time the switch is pressed the lower lamp will turn on. After F4, F1 will turn on. Lamps of an unmounted frequency will be skipped.

4.1.2 Pattern and frame

The measuring pattern and whether framing is provided or not are selected here.



SRG : Shift Register

⊕ : Exclusive or gate

Fig. 4-2 Chart of PRBS Pattern Generator

(1) Pattern

Table 4-2 Explanation of PATTERN/FRAME Function in Transmitter

No.	Marking	Description
(1)	PRBS	The ME462B issues the Pseudo Random Binary Sequences (PRBS) according to the CCITT REC.0.151. One word of the PRBS pattern has $2^{15}-1 = 32,767$ bits. Error measurement is done mostly with the PRBS pattern
(2)	1111	The all one pattern is used to measure the transmission power of a digital micro system
(3)	1100	• These are repetition patterns of 1100 and 1010, respectively. Since they have relatively short periods and simple patterns, they are used to perform troubleshooting and to monitor the occurrence of the jitter of the equipment being measured
(4)	1010	

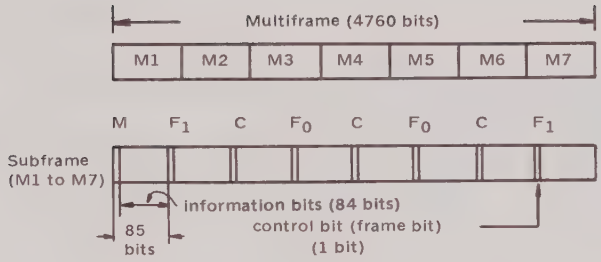
Table 4-2 Explanation of PATTERN/FRAME Function in Transmitter (Cont'd)

No.	Marking	Description
③	1100 (cont'd)	• The 1010 pattern with DS-3 framing is the BLUE SIGNAL. When an abnormality is found in the equipment being measured, this signal is to be issued first at an upper station to prevent lower stations from issuing the same alarm. • When the BLUE SIGNAL is sent, a frame bit (refer to Fig. 4-3) is always followed by 1010 ...
④	1010	

(2) Frame

Table 4-2 Explanation of PATTERN/FRAME Function in Transmitter (Cont'd)

No.	Marking	Description
⑤	FRAMING	Figure 4-3 shows the frame configuration of the DS-3



Fl F0 F0 Fl bits:

frame alignment signal (1001)

C bits:

Is to be set at 0 level for the ME462B.

M bits of Ml and M2:

x-bits

M bits of M3 and M4:

P-bits

M bits of M5, M6, and M7:

Multiframe alignment signal (010)

Fig. 4-3 Frame Configuration

A multiframe consists of 7 subframes, each of which has 8 blocks. Each block has a 1-bit control bit and 84-bit information bits. The pattern explained in (1) is set into the information bits.

The X-BITS are usually (1,1) but can be changed by adding an external signal to the [X-BIT INPUT] (7). Figure 4-4 shows the relationship between an external signal and X-bits output. The figure also indicates the phase relationship between the [MULTIFRAME SYNC OUTPUT] (6) and the frame signal of the output pattern.

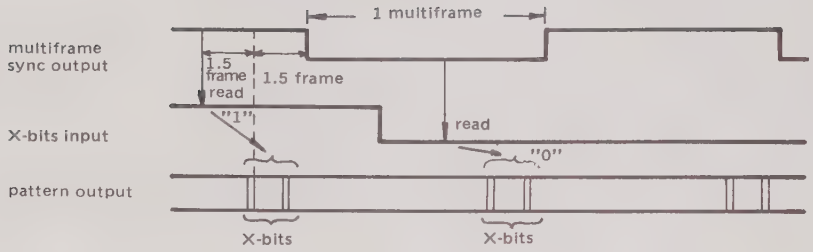
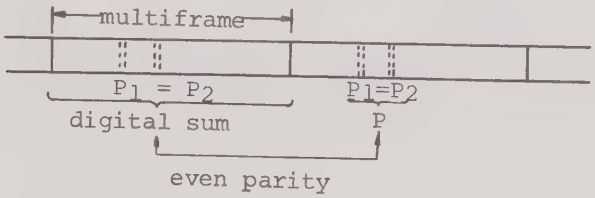


Fig. 4-4 Chart of X-bits and External Signals

The P-BITS are parity bits determined as follows (refer to Fig. 4-5).

If the digital sum of all information bits (4704 bits) in the previous multiframe is 1, P=11. If the same digital sum is 0, P=00.



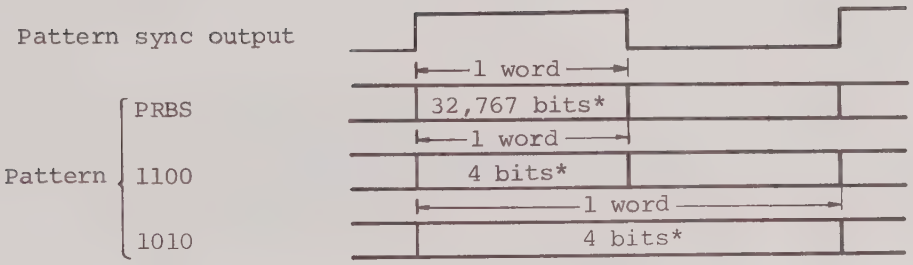
Digital sum;

For the total number of 1 is even:
digital sum = 0

For the total number of 1 is odd:
digital sum = 1

Fig. 4-5 Chart of Parity Bits

Figure 4-6 shows the relationship between an output pattern and PATTERN SYNC OUTPUT.
If an output pattern is 1111, the pattern sync output is not issued.

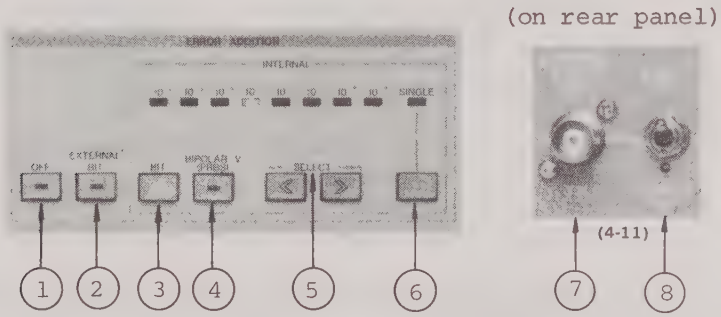


* For with-framing, the word length is longer by the frame bits.

Fig. 4-6 Chart of Pattern Sync Output

4.1.3 Error addition

The ME462B adds two types of errors: internally occurring errors and errors caused by external signals. Usually, when an error is not added, it is set to OFF (1).



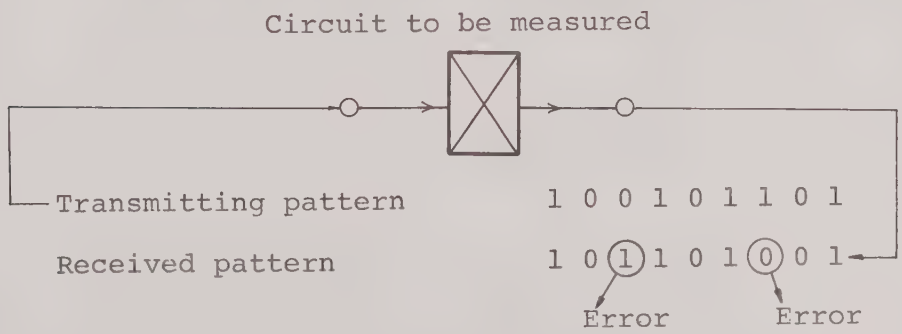


Fig. 4-7 Bit Error in the Circuit to be Measured

(1) Internal

Table 4-3 Explanation of ERROR ADDITION Function in Transmitter

No.	Marking	Description
(3)	BIT	• As shown in Fig. 4-7, the bit error indicates a difference between the transmitting and received patterns. • The ME462B can add at the rate of 10^{-2} to 10^{-9} or single. Here, for example, 10^{-9} means the addition of a 1-bit error pulse per 10^{9} bits. • When an output pattern is with framing, the addition of a bit error causes PARITY ERROR due to the following reason. • As shown in Fig. 4-8, a parity error is due to the difference between the digital sum of all information bits in the previous multiframe and parity bits. Since the digital sum of the ME462B is calculated before errors are added, the addition of bit errors after calculations may change the digital sum, resulting in a parity error. A parity error may also occur when bit errors are added directly to a parity bit. • The parity error, based on the digital sum, has the following features: ° Maximum error rate = 1/4,760 $\fallingdotseq$ 2.1 x 10^{-4} ° If an even number of errors is added to the information bits, a parity error cannot be detected because the digital sum does not vary. ° If an error is added to the control bits except for parity bits, a parity error cannot be detected. • Because of the above characteristics, the following difference will appear between the actual parity error value and the added parity error display of a bit error. The difference will be almost same for an error rate of less than 10^{-4}, and will be below 10^{-4} for an error rate of 10^{-2} or 10^{-3}.

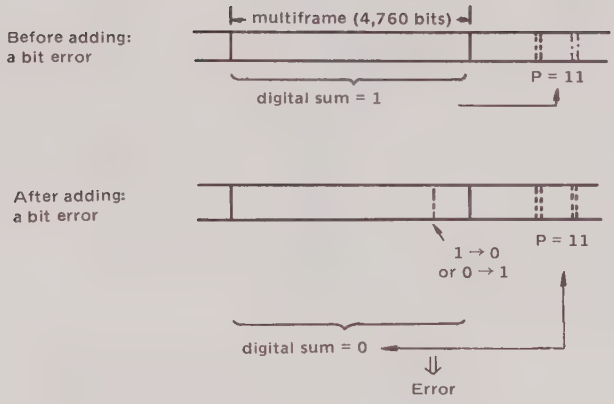


Fig. 4-8 Chart of Parity Error

Table 4-3 Explanation of ERROR ADDITION Function in Transmitter (Cont'd)

Operation:	Pressing the [BIT] switch (3), first turns the previously used lamp goes on. The SELECT switch (5) is used for modifications. For each time of the switch being pressed, lit lamp is shifted one either to the right or left. When the [≫] switch is pressed for 10^{-9}, lit lamp is shifted to 10^{-2}. When the [≪] switch is pressed for 10^{-2}, lit lamp is shifted to 10^{-9}. The [SINGLE] lamp goes on when the switch (6) is pressed. An error is added each time it is pressed.

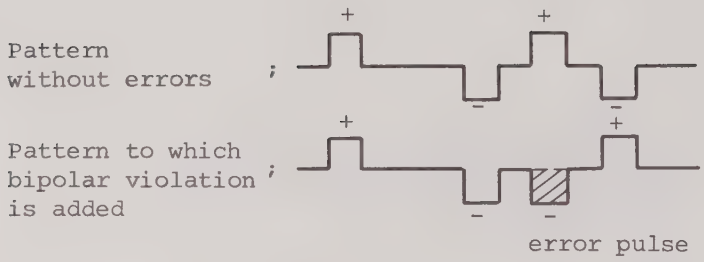


Fig. 4-9 Chart of Bipolar Violation

Table 4-3 Explanation of ERROR ADDITION Function in Transmitter (Cont'd)

No.	Marking	Description
(4)	BIPOLAR VIOLATION	• Bipolar violation is added only to the DS-3 output. As shown in Fig. 4-9, the polarity of a mark alternately changes + and - as the bipolar rule specifies, but the addition of bipolar violation breaks this rule to produce a mark of ++ or --. Furthermore, this addition of bipolar violations is executed so as not to cause bit or parity errors. That is, a false B3ZS code (00 V or 10 V) must not be produced or an already converted B3ZS code must not be altered. (This bipolar violations are added only when measuring pattern is selected for [PRBS].) • The range of addable error rates and the operation method are the same in the case of [BIT].

(2) External

Table 4-4 Explanation of ERROR ADDITION Function in Transmitter

No.	Marking	Description
(2)	EXTERNAL BIT	• Only bit error can be added directly, however, this bit error may be also cause a parity error same as in INTERNAL case. By turning this switch ON and applying a external signal to the EXTERNAL ERROR INPUT (7) on the rear panel the following two types of bit errors can be added as shown in Fig. 4-10 (Change over switch (8)). For SINGLE, a one-bit error is added at each fall of an external signal and for BURST, a bit error is added successively while an external signal is low.

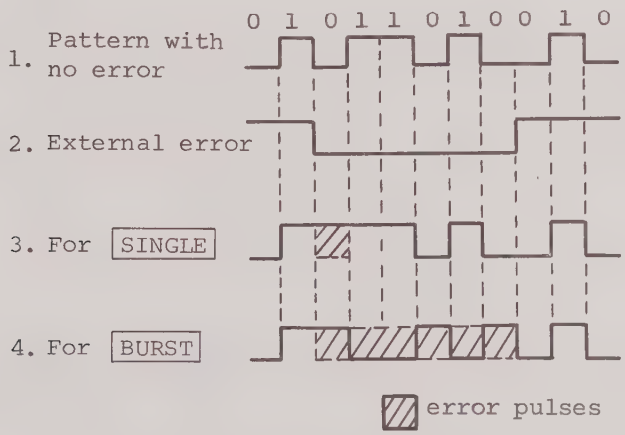


Fig. 4-10 External Error

4.1.4 DS-3 Output

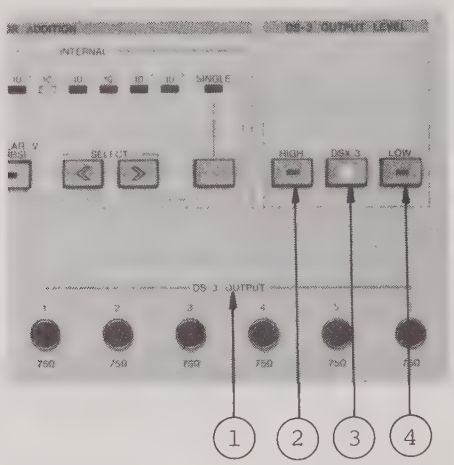
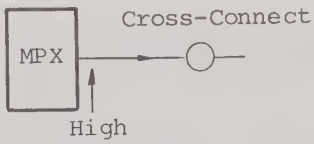
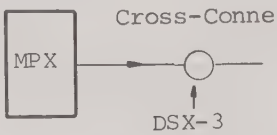
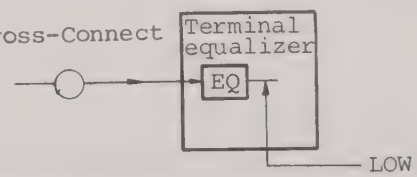


Fig. 4-11 DS-3 Output

(1) Level

The following three levels are selected according to the points to be measured.

Table 4-5 Explanation of DS-3 OUTPUT Function in Transmitter

No.	Marking	Description
(2)	HIGH	Used for measurement with pulse waveforms. 
(3)	DSX-3	This is the standard measuring level of the DS-3 system. 
(4)	LOW	• The waveform is the same as that of HIGH, but this level is 13.8 dB lower than the High. • This level is used for the equalizer output point of the equipment to be measured. 

(2) Output

Each output is sequentially delayed by 3 bits to eliminate the interference between the outputs as shown in Fig. 4-12.

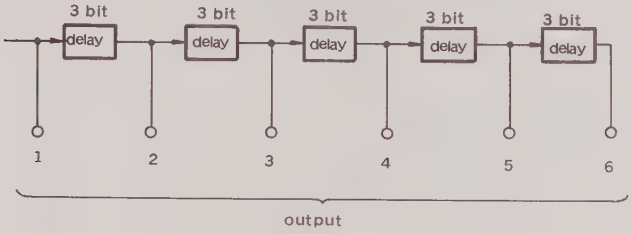
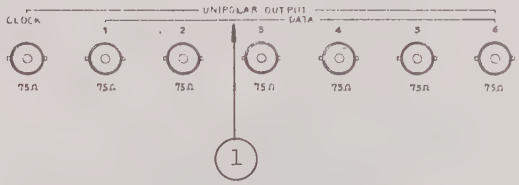


Fig. 4-12 Output Phase

4.1.5 Unipolar Output

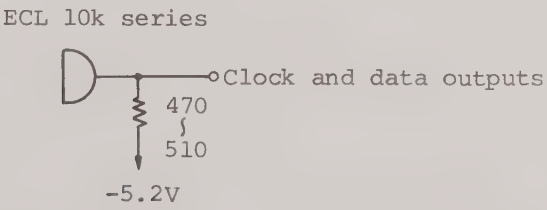
The ME462B can perform the same measurements with the unipolar signal as with the DS-3 signal.



(1) Level

The standard level is +1 V/-1 V, but 0/+2.4 V (TTL compatible/ 75 Ω) or ECL can be also used by changing the connection of the connectors (see 3.4.1).

The below drawing is the output circuit for ECL.



(2) Output

To avoid the correspondence between outputs, each data output is provided with the phase differences shown in Fig. 4-13.

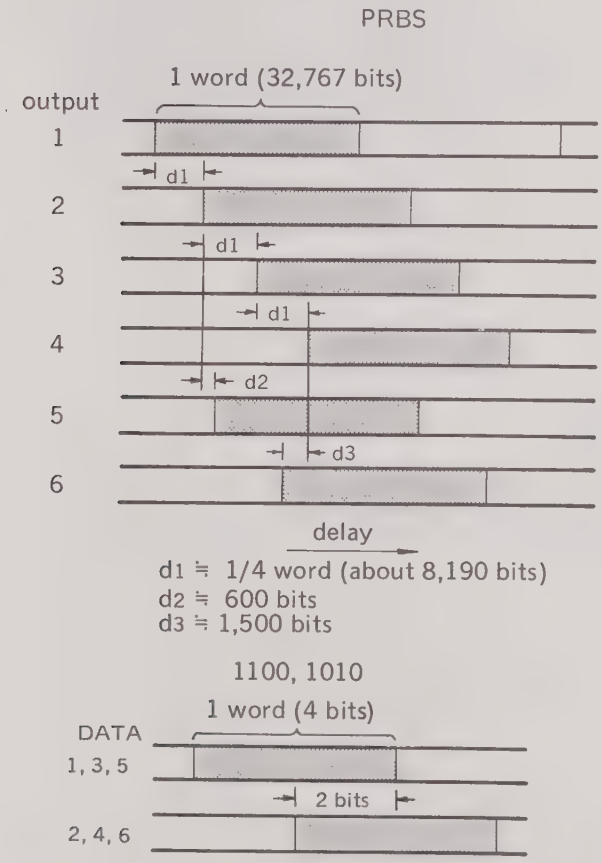


Fig. 4-13 Output Phase

4.2 Receiver

4.2.1 DS-3 and Unipolar Input

The following is selected in accordance with the input signal and level.

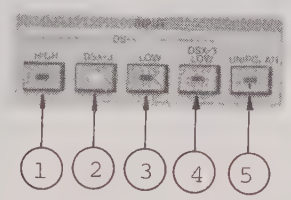


Fig. 4-14 Input

Table 4-6 Explanation of DS-3 and UNIPOLAR INPUT Function in Receiver

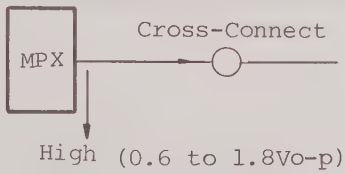
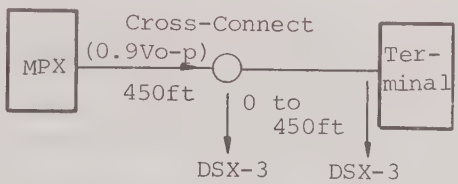
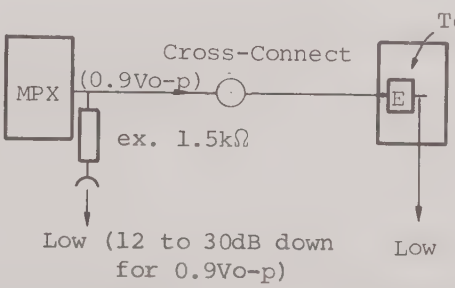
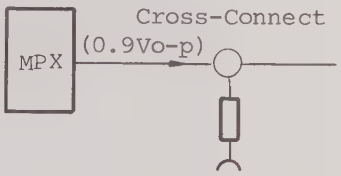
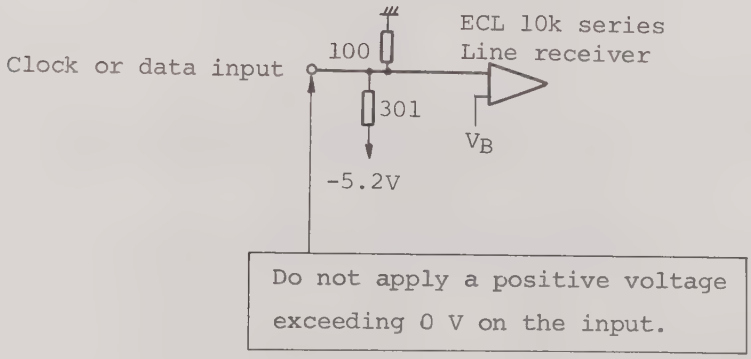
No.	Marking	Description
(1)	HIGH	Used for measurements with pulse waveforms 
(2)	DSX - 3	Used at a cross-connect point or at any point on the cable 0 to 450 feets pass through from the cross connection. 
(3)	LOW	Used to monitor a signal through a resistance at a high level point and to measure at the equalizer output point of the equipment to be measured 

Table 4-6 Explanation of DS-3 and UNIPOLAR INPUT Function in Receiver (Cont'd)

No.	Marking	Description
④	DSX - 3 LOW	Used to monitor a signal through a resistance at the cross-connect point  DSX-3 Low (15 to 30dB down for 0.9 Vo-p)
⑤	UNIPOLAR	For unipolar input,both clock and data inputs are required. The standard level is +1V/ -1V, but 0/ +2.4V(TTL compatible/75Ω) or ECL can also be used by changing the internal connection of the connectors (see section 3.4.2). The following figure shows the input circuit for ECL.



4.2.2 Pattern and Frame

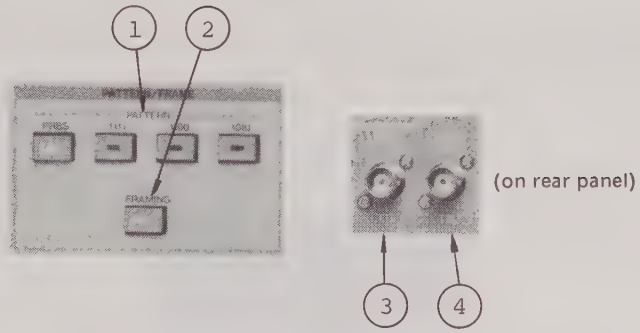


Table 4-7 Explanation of PATTERN and FRAME Function in Receiver

No.	Marking	Description
(1)	PATTERN	PATTERN and FRAME are selected according to the received signal. Generally, they are set like as the transmitting section. However the PATTERN (1) is optional in the following cases. Namely a received signal is the signal of live traffic in service and only parity error or bipolar violation are to be measured.
(2)	FRAMING	

The phase relationship between MULTIFRAME SYNC OUTPUT (3), pattern input and X-bits OUTPUT (4) are shown in Fig. 4-15.

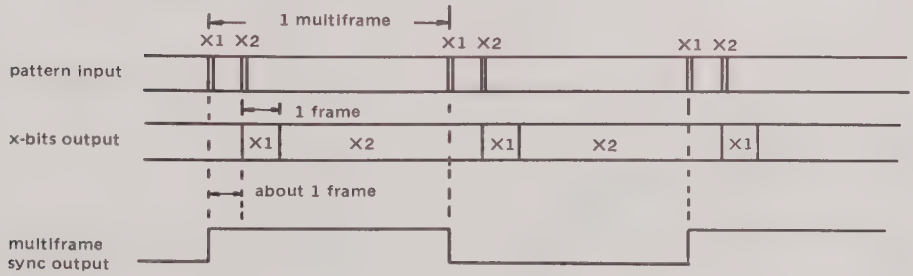
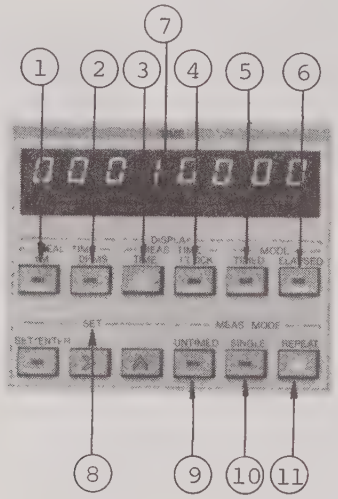


Fig. 4-15 Phase Relationship between Multiframe SYNC Output and Each Signal

4.2.3 Time

This corner performs display and setting for the measuring time and real time clock.



(1) Display

Anyone of the following six types is displayed.

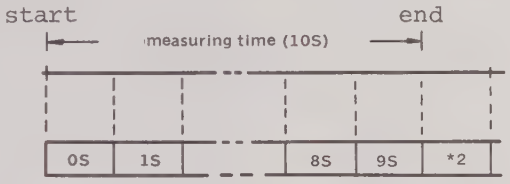
Table 4-8 Explanation of TIME Function in Receiver

No.	Marking	Description
(1)	YM	• Pressing this switch, displays the year and month of the real time clock. • Only the lower two digits of the year are displayed • Display 83 05 (May, 1983)
(2)	DHMS	• The Day, Hour, Minute, and Second of the real time clock are displayed • Display 18 15 26 30 (18 days, 15 hours, 26 minutes, 30 seconds)

Table 4-8 Explanation of TIME Function in Receiver (Cont'd)

No.	Marking	Description
(3)	TIME	• The measuring time is displayed in hours. • Even if the measuring time is set to CLOCK, by pressing this TIME switch, the measuring interval is calculated and displayed in hours. In this case, for no signal, the display is -----. However, measurement must be started once so that TIME can be displayed. • For UNTIMED (9), the display is -----. • The time is displayed up to 99 days: 23 hours, 59 minutes, and 59 seconds. • Display 30 00 00 00 : Measuring time 30 days Measurement start — measuring time: 30 days — end
(4)	CLOCK	• If the measuring time is set by the bit number of a clock, the bit number is displayed and a lamp (7) is turned on. • The display becomes ----- when this CLOCK switch is pressed under the condition of setting the measuring time to TIME or when MEAS MODE is set to UNTIMED (9). • Display 1E 10 : (10^{10} bits) Measurement start — measuring time: clock 10^{10} bits — end
(5)	TIMED	• The remaining measuring time is displayed. • Even if the measuring time is set to CLOCK, the remaining time is calculated and displayed. However, measurement must be started once so that TIMED can be displayed. • For UNTIMED, the display is -----. • Measurement start — measuring time (10S) — end 10S | 9S | ... | 2S | 1S | *1 Display (The display format is the same as TIME (3).) *1 • When MEAS MODE is SINGLE (10), the display is 0 s. • When MEAS MODE is REPEAT (11), the display is 10 s.

Table 4-8 Explanation of TIME Function in Receiver (Cont'd)

No.	Marking	Description
(6)	ELAPSED	• The elapsed measuring time is displayed. • Even if the measuring time is set to CLOCK, the elapsed time is calculated and displayed. However, measurement must be started once so that ELAPSED can be displayed. • Measurement  Display (The display format is the same as TIME (3).) *2 • When MEAS MODE is UNTIMED (9) or SINGLE (10), the display is 10 s. • When MEAS MODE is REPEAT (11), the display is 0 s.

(2) Time Mode

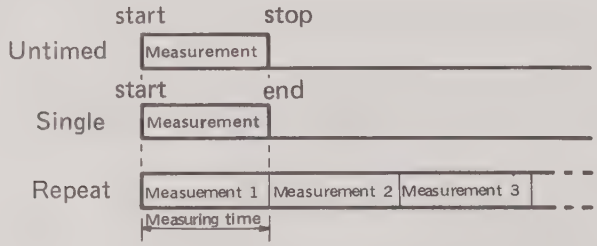


Fig. 4-16 Time Mode Display

Table 4-9 Explanation of Time Mode in Receiver

No.	Marking	Description
(9)	UNTIMED	• Used when measurement is to be carried out for an optional time period without setting the measuring time. Measuring operation (Start/Stop) is controlled by the MEASURING START/STOP switch.
(10)	SINGLE	• Only one measurement is made and its result retained. • Since single has only one data item for one measurement, data can be easily read.
(11)	REPEAT	• This is used to repeat measurements after one measuring time has elapsed. • This is very convenient to obtain data by several measurements or by changing parameters such as the C/N-error rate.

(3) Set ⑧

How to set real time clock or measuring time

Operation:

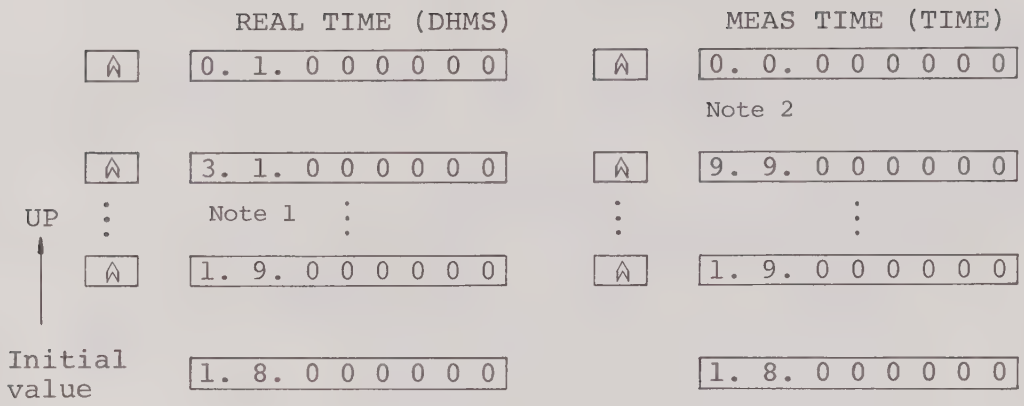
(1) When press the [SET/ENTER] switch, a lamp in the switch is turned ON. It shows the modification state of real time clock or measuring time. If the display switch was set to [TIMED] or [ELAPSED], DISPLAY shifts from this to anyone of [MEAS TIME] (according to an existing measuring time).

(2) If an item to be set is different from the switch whose lamp is now ON, press the pertinent switch ① to ④. The previously set value will then be displayed.

(3) The position of the LED to be changed is determined by the shift key [≫].
The dots of the LED to be changed light. Each time the key is pressed two LEDs shift to the right as a pair.
When the extreme right is reached shifting starts from the extreme left again when the key is pressed. However, when MEAS TIME is [CLOCK], the dots are not shift.

(4) Change the display values by the shift keys [∧].
The display value increases by one each time one of them is pressed. If they are pressed during one second or more, the display changes automatically. Figure 4-17 is an example of a display change.

(5) When the [SET/ENTER] key is pressed again, the set value is memorized and the system is ready to start measurement. Then, when the [START/STOP] switch is pressed, measurement starts.



Note 1: Assuming that the month of a real time (YM) is April, this value is up to 30.

Note 2: If the ENTER switch is pushed in this state (all 0), data is not entered.

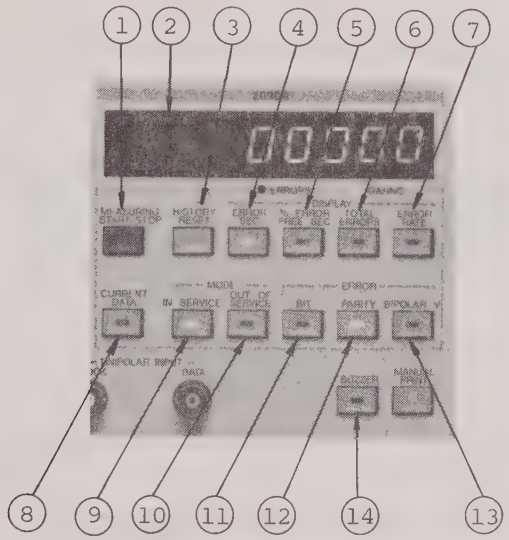
Fig. 4-17 Display change (example)

4.2.4 Error

Here, a measuring mode is selected and measured results are displayed.

(1) Error

The ME462B detects BIT error, PARITY error and BIPOLAR violation simultaneously. It also performs measuring items such as error seconds, error-free seconds, total errors, and error rates at the same time. These measured results are stored internally. The user can select combinations to error detection and measuring items to be displayed by switch operation and output the data to the LED display.



With the ME462B, the display of inapplicable error display can be suppressed. By using the DIP switch on the rear panel together with MODE switch, the ME462B can display and printout data only on the following errors.

MODE switch \ DIP switch (see section 3.4.2(3))	OFF	ON
IN SERVICE	PARITY, BIP.V	PARITY
OUT OF SERVICE	BIT, PARITY, BIP.V	BIT

Table 4-10 Explanation of ERROR Function in Receiver

No.	Marking	Description
(9)	IN SERVICE	• In the case of measurement on live traffic, the bit error measurement would record all errors. This incorrect data may give misinterpretation. • To avoid this, the bit error display is suppressed. • In this mode, FRAMING switch always becomes ON.
(10)	OUT OF SERVICE	• All kind of error are displayed.
(11)	BIT	As Fig. 4-18 shows, a bit error is detected by comparing received pattern with internally generated reference pattern, which synchronizes with a received pattern and is independent of its bit sequences, and can detect completely the error which occurred, but the measuring pattern must be a known pattern (PRBS, 1100 etc.)

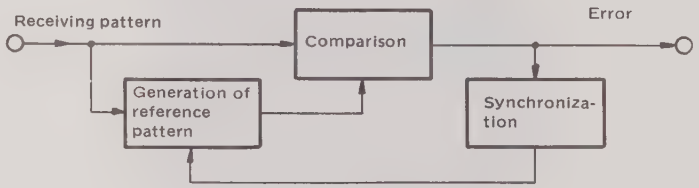


Fig. 4-18 BIT Error Detection Circuit

Table 4-10 Explanation of ERROR Function in Receiver (Cont'd)

No.	Marking	Description
(12)	PARITY	• A parity error can be detected only when the pattern is with framing. • Detected by comparing the digital sum of all information bits in the previous multiframe with parity bits (see section 4.1.2 Pattern and Frame). • Used to monitor the signal of live traffic in service.
(13)	BIPOLAR V	• Bipolar violations can be detected only for DS-3 signals. • Detection is performed by a double-violation method as shown in Fig. 4-19.

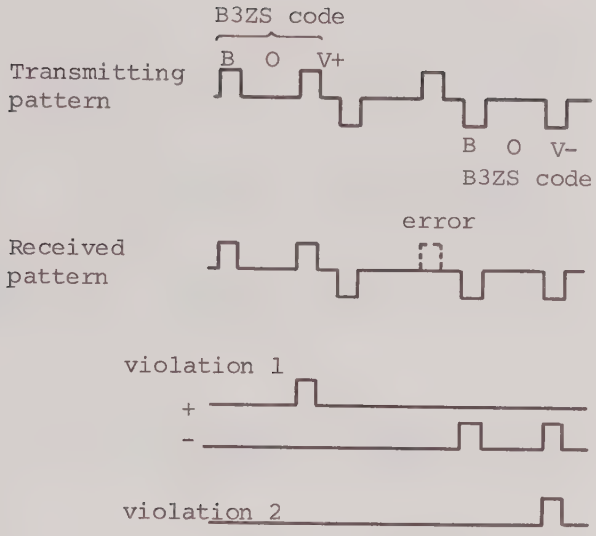


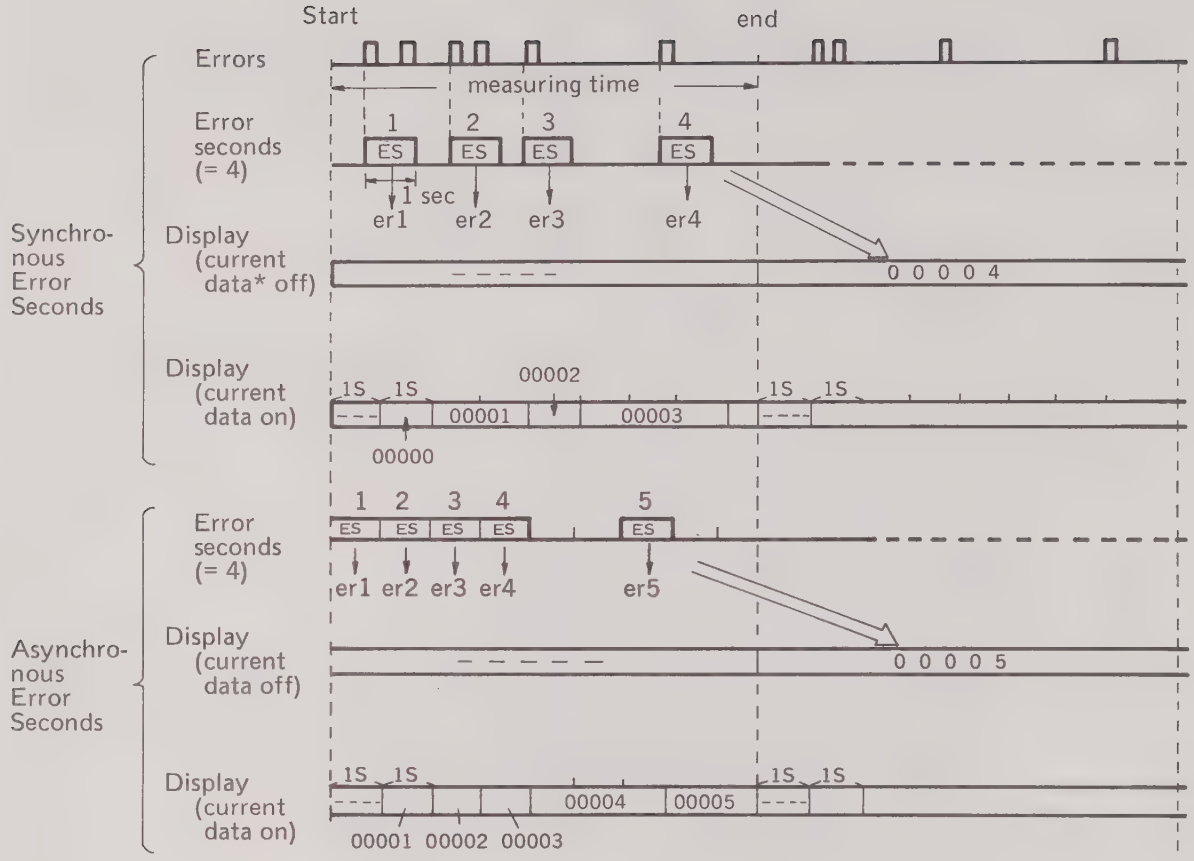
Fig. 4-19 Bipolar Violation Detection Method

The feature of this circuit is to be able to detect an error of V-bit polarity (alternate repetition of + and -). Bipolar violation is used to monitor the signal of Live Traffic in Service.

(2) Measuring Item

Table 4-11 Explanation of Measuring Item in Receiver

No.	Marking	Description
④	ERROR SECONDS	• Error seconds are the number of seconds in which at least one or more errors have occurred as shown in Fig. 4-20. • The receiver can measure either synchronous or asynchronous error seconds by setting the DIP switch in the rear panel. (see section 3.4.2(3)) • Synchronous error seconds: The one-second period starts synchronously with the occurrence of an error. • Asynchronous error seconds: A measuring time is divided in units of a second and the number of second units in which at least one error occurred is counted.



* See (4) for the current data

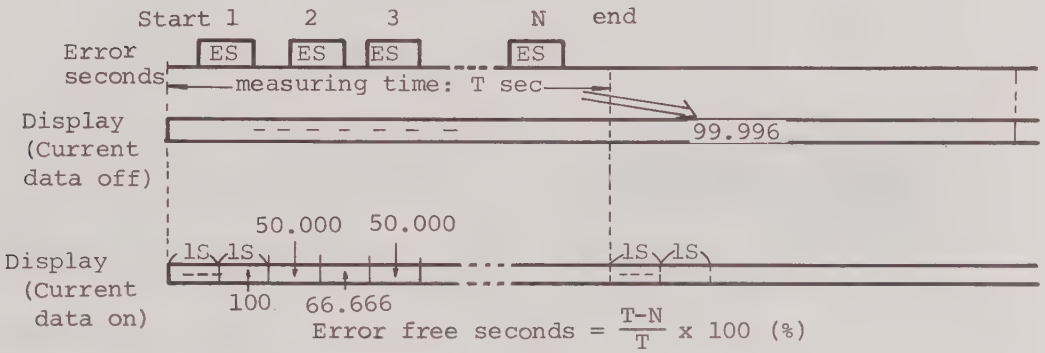
Display range: 00000 to 99999 to 9.9E09 (9.9 x 10^9)

Fig. 4-20 Error Seconds

The er_1, er_2, --- that express Error Rate in Error Seconds is used to measure the threshold error seconds. And measured threshold error seconds can be printed on built-in PRINTER (option).

Table 4-11 Explanation of Measuring Item in Receiver (Cont'd)

No.	Marking	Description
(5)	ERROR FREE SECONDS	• As Fig. 4-21 shows, error free seconds is the ratio of the time minus the error seconds to the measuring time. • The display is expressed in percentage (%). • There are two type of error free seconds as same error seconds - synchronous and asynchronous.



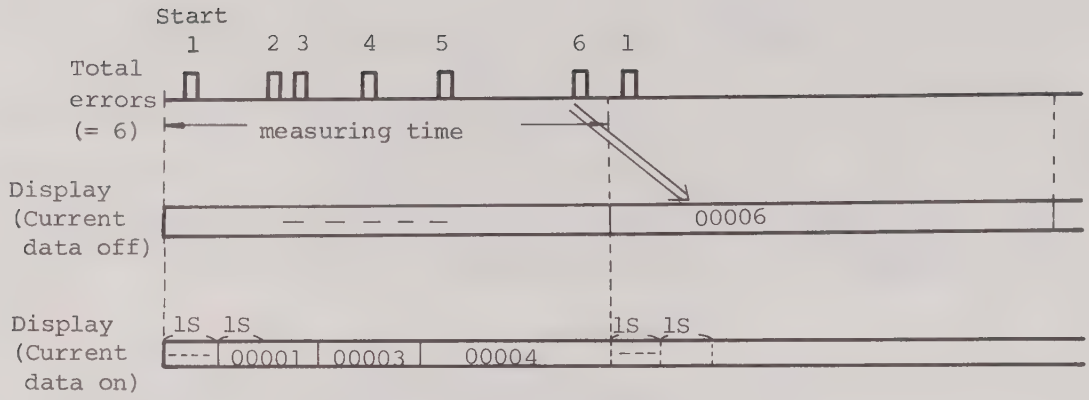
Display range: 100 to 99,999 to 00,000 (%)

Fig. 4-21 Error Free Seconds

For error free seconds, threshold error seconds are also measured and printed on the built-in PRINTER (option).

Table 4-11 Explanation of Measuring Item in Receiver (Cont'd)

No.	Marking	Description
(6)	TOTAL ERRORS	As Fig. 4-22 shows, total errors is the accumulated sum of errors. This mode is usually used when the number of errors is small.

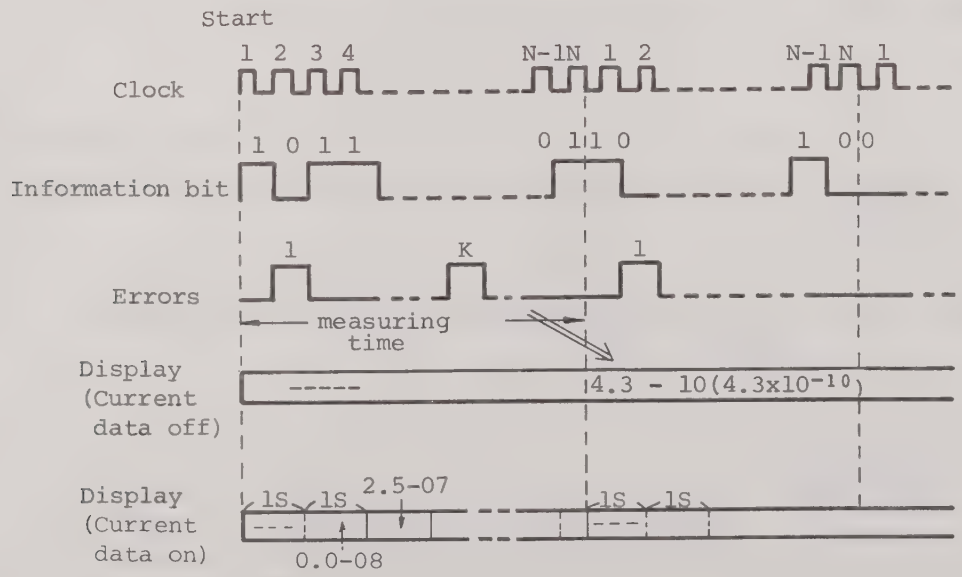


Display range: 00000 to 99999 to 9.9E09 (9.9×10^{9}) to OFL (Over Flow)

Fig. 4-22 Total Errors

Table 4-11 Explanation of Measuring Item in Receiver (Cont'd)

No.	Marking	Description
(7)	ERROR RATE	As Fig. 4-23 shows, error rate is the ratio of the total number of all error bits to all information bits (equal to the total number of all clocks) in a measuring time.



ERROR Rate = $\frac{K}{N}$

Display range: 1.0-15(1.0×10^{-15}) to 9.9-02 (9.9×10^{-2}) to OFL (Over Flow)

Fig. 4-23 Error Rate

(3) Status Output

Alarm and measuring status are displayed by lamps, buzzer and output.

The ME462B has two types of lamps: alarm lamps and alarm history lamps. The alarm lamps light only during the abnormality, while the alarm history lamps remain ON after the alarm status is restored.

The alarm history lamps are convenient because they memorize the alarm status making it unnecessary to constantly watch the alarm display. To reset this status, press the [HISTORY RESET] switch (3).

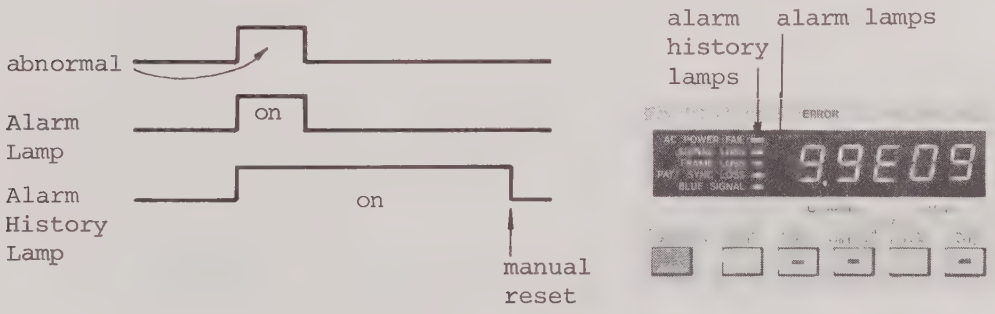


Fig. 4-24 Status Output Chart

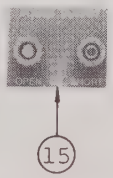
Table 4-12 Explanation of Status Output in Receiver

No.	Marking	Description
(2)	[Lamps display]	AC POWER FAIL: This lamp lights after AC power is restored. For Error Second and Error Free Seconds measurements, measured data is held during power failure and measurements are continued after power is restored. In performing this measurements, AC power failure is discriminated from that of normal ON/OFF operation of the power switch. SIGNAL LOSS: This lamp lights if the input signals are interrupted for about 10 ms. For unipolar signal inputs, the lamp lights if either clock or data fails.

Table 4-12 Explanation of Status Output in Receiver (Cont'd)

No.	Marking	Description
(2)	Lamps display (cont'd)	FRAME LOSS: The lamp always turns off when the FRAME (4.2.2) is OFF. The lamp lights when 3 out of the 15 F bits are in error or 2 out of the 3 M bits (010) are in error, and turns off when 15 successive F bits are correct and 2 successive M bits are correct. PATTERN SYNC LOSS: The lamp always turns off when MODE is IN SERVICE (9). This lamp lights when errors per 2×10^5 clock bits exceed 2×10^4 bits, and turns off when a normal pattern of about 30 bits is entered. BLUE SIGNAL: This lamp lights when 1010 pattern with DS-3 framing is received. ERRORS: This lamp lights for about 100 ms each time an error pulse is detected. In addition, only the errors selected by ERROR ((11), (12), and (13)) shown in 4.2.4 (1) are displayed. GATING: This lamp is on during measurements. When repeating measurements, it turns off for about 100 ms when one measurement is completed and the next one is started.
(14)	BUZZER	When the switch is kept to ON, a buzzer sounds in the following cases: SIGNAL LOSS, FRAME LOSS, PATTERN SYNC LOSS, BLUE SIGNAL (Note 1), and ERRORS (Note 2). (Note 1): When the setting pattern of the receiver is 1010 pattern with framing, the buzzer does not sound. If does not work out this counter-plan, the measuring pattern and BLUE SIGNAL coincide and the buzzer continues ringing. (Note 2): Only errors for which an audible alarm is issued are selected by ERROR ((11), (12), and (13)) shown in 4.2.4 (1) in the same way as ERRORS lamp (2).

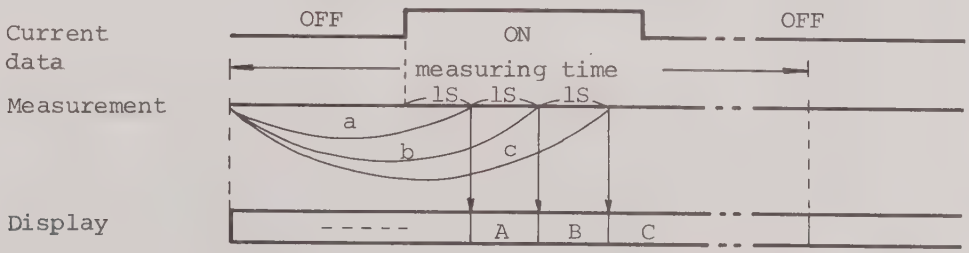
Table 4-12 Explanation of Status Output in Receiver (Cont'd)

No.	Marking	Description
(15)	ALARM OUTPUT (on rear panel) 	The two terminals in the figure to the right are almost open, but short -circuited when an alarm state occurs. This output, synchronizes with the alarm history lamps of (2), and is short circuited when either of them is ON.

(4) Others

Table 4-13 Explanation of Other Function in Receiver

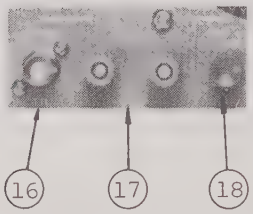
No.	Marking	Description
(1)	MEASURING START/STOP	When measurement are stopped, pressing this switch resets the display values and starts the measurements. In measurement, pressing this switch stops the measurement.
(8)	CURRENT DATA	This function is used to check measurements half way for a long measuring time or to know the data obtained so far. When this switch is turned ON, the measurement results are displayed every second as shown in Fig. 4-25. This switch can be turned ON or OFF during measurements.



A, B, and C are the measured values after a, b, and c (time) have elapsed, respectively.

Fig. 4-25 Chart of Current Data

(5) Monitor Input



This function is supported only if the PRINTER (OPTION) is built-in or GP-IB or RS-232C operation is performed. The MONITOR of the DIP switch located on the rear side must be turned ON (See section 3.4.2 (3)). This function is used for checking the correlation between fading and error generation. The AGC voltage proportional to the field strength of the terminal equipment or repeater is added to [VOLTAGE] (17) and the carrier group alarm signal etc is added to [STATUS] (16).

For further details, see section 4.2.5 (4), (5).

Table 4-14 Explanation of Monitor Input in Receiver

No.	Marking	Description
(16)	[STATUS]	TTL interface
(17)	[VOLTAGE]	By applying a high voltage to the terminal side, measurements up to ±20 V can be measured.
(18)	[REF V STORE]	Used to set the reference voltage for measuring TIME RATE. When this switch is pressed, the voltage added to the [VOLTAGE] (17) is displayed on the ERROR LED for 2 seconds or so.

4.2.5 PRINTER (OPTION)

Note: When the printer is used, the recording paper must have been supplied before the power switch of the ME462B Receiver is turned ON.

If the recording paper is not supplied at this time, nothing is printed on the printer, because the ME462B Receiver judges that the printer is not incorporated.

The printer prints the following items:

- Measured results
- Analysis contents
- Alarm contents
- Correlation between externally applied voltage and error rates.

For any of the above, the real time clock is printed at the same time.

The printing format is shown in Fig. 4-26. Printing format (b) can also be used by changing the DIP switch on the rear panel (See section 3.4.2 (3)).

In the following printing example, the explanation is based on the printing format of Fig. 4-26 (a).

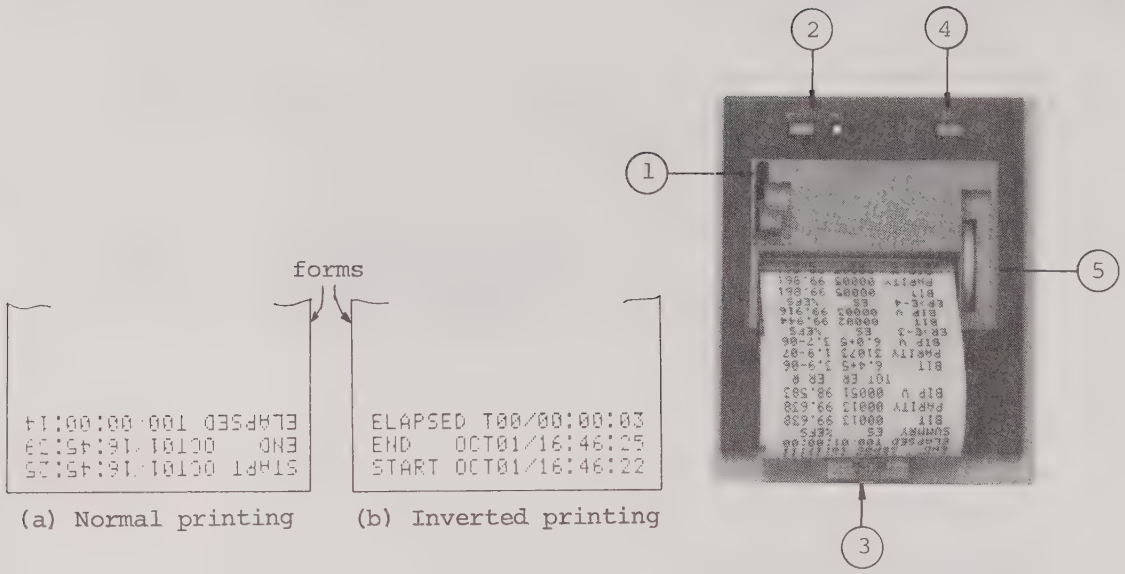


Fig. 4-26 Printing Format

(1) Before printing

(i) Check that enough forms are supplied. When the forms run out, the [PRINT] (2) switch automatically turns off. See section 4.2.5 (6) for details about supplying forms.

(ii) Check that the lever (1) is down. Otherwise, the [PRINT] (2) switch will not be ON.

(iii) Turn the [PRINT] (2) switch ON.

(2) Printing of measured results, analysis content.

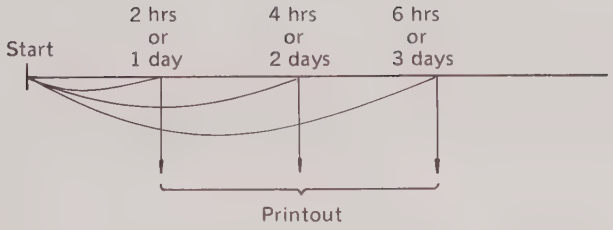
This data is output under the following conditions:

(a) When the measurement is completed

(b) When the MEASURING START/STOP switch is pressed.

(c) When the MANUAL PRINT switch is pressed.

(d) Every two hours after the measurement starts for measuring times less than 48 hours, or everyday for measurement times more than 48 hours. The data at each printout is the cumulative total from the start of the measurement, as shown in the figure below.



The printouts produced in this case are shown in Fig. 4-27. The printout (b) is a shortened form of the printout (a). The shortened form is printed when the DIP switch on the rear panel is set to SHORT. (see section 3.4.2 (3))

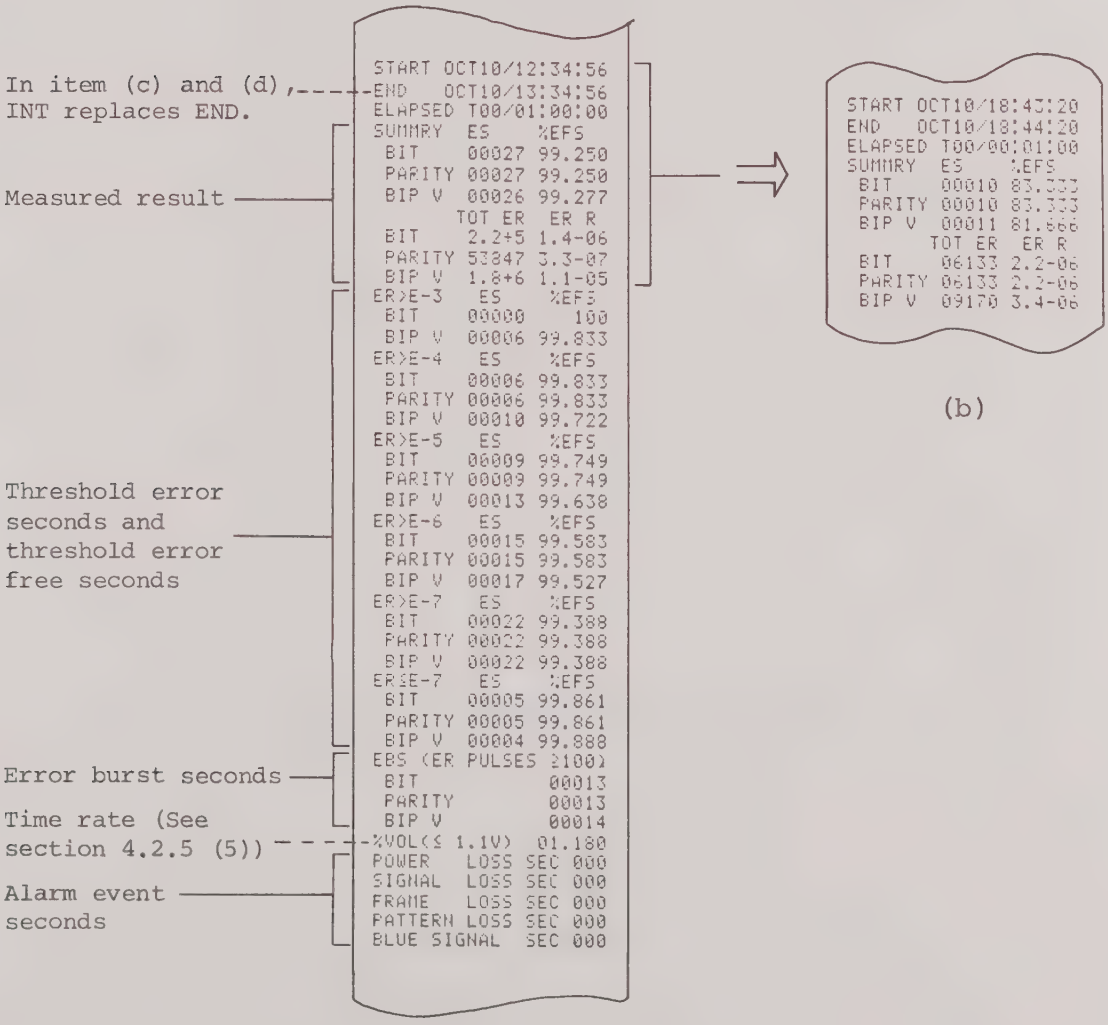


Fig. 4-27 Printing Format

(3) Printing alarm contents

Printing is done when an alarm occurs and when it is restored.

Printing is as follows:

Occurrence or Restoration time

Alarm contents

Table 4-15 shows the alarm contents.

Table 4-15 Alarm Printing Contents

Occurrence time	Restoration time
POWER LOSS*	POWER GAIN
SIGNAL LOSS	SIGNAL GAIN
FRAME LOSS	FRAME GAIN
PAT SY LOSS	PAT SY GAIN
BLU SIG DET	BLU NOT DET

* Printing is done when the power supply is restored.

An example of printout in case of signal loss

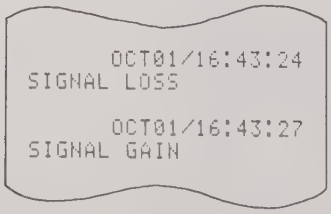


Fig. 4-28 Printing Format

(4) Printing of externally applied voltage and error rate

The ME462B is capable of simultaneously printing out the externally applied voltage, error rate, and the status input level.

The Dip switch on the rear panel supports the following functions (See section 3.4.2 (3)).

(i) Print out each time an error occurs.

(ii) Printed out only if the error rate in one second is $>10^{-3}$.

(iii) No printing under any conditions.

(iv) Prints out minimum voltage value.

(v) Prints out maximum voltage value.

(vi) Prints out error rate only.

However, these are not printed when measurement stops.

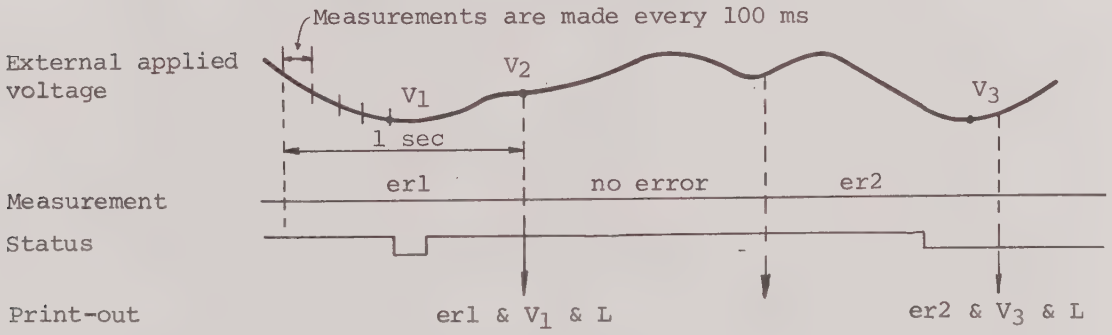
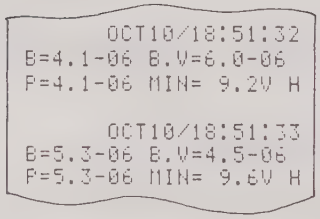
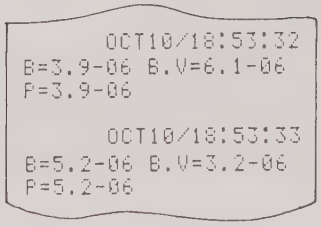


Fig. 4-29 Externally Applied Voltage Printing Example (Example of printing the minimum value)

An example of print-out is shown in Fig. 4-30



(a) MONITOR INPUT: ON



(b) MONITOR INPUT: OFF

Fig. 4-30 Printing Format

By setting an internal switch (see section 3.4.2 (2)), the ME462B printout can be squelched to reduce paper consumption. The following printout procedure then results:

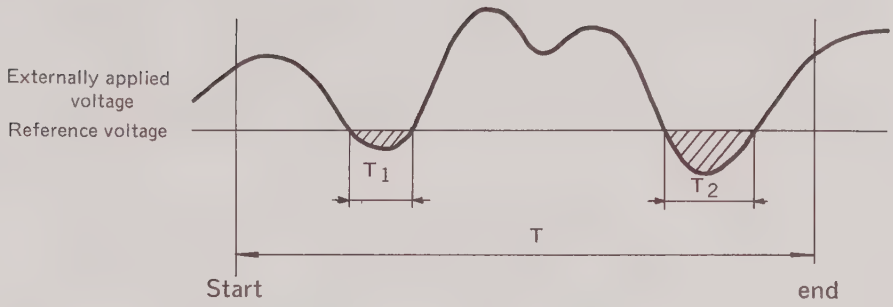
(a) Errored second printout is suppressed after ten continuous errored seconds are recorded.

(b) Following (a), errored second printout is resumed when ten continuous error free seconds occur.

(c) Steps (a) and (b) repeat alternately. Setting the printer squelch function does not affect the printout of the measurement and analysis data and the alarm data.

(5) Time Rate:

Time Rate in Fig. 4-31 is calculated as follows:



$$\text{time rate} = \frac{T1 + T2}{T}$$

Fig. 4-31 Time Rate

Time rate can be measured only if the MONITOR INPUT (See section 3.4.2 (3)) of the DIP switch on the rear panel is ON. This switch can measure rate by which the externally applied voltage is below the reference voltage (Minimum setting) or the rate by which it is higher than the reference voltage (Maximum setting).

(6) Replenishment of the recording paper

A red mark is printed on the edge of the Thermal recording paper to indicate that the paper have nearly run out (for last 1 m length).

Replenish the paper as follows:

(i) Turn the [PRINT] (2) switch off.

(ii) Press the [PRINTER EJECT] (3) switch under the printer.
The printer is then unlocked and comes forward.
Hold the front frame and slowly pull the printer until it stops halfway.

(iii) Remove the remained paper and replenish the new paper. Be sure to insert the paper correctly. The print side is on the outside.

Before loading the paper, it is convenient for loading to slacken the paper by 300 mm in length.

(iv) Lift the lever (1) before passing the recording paper and make a fit its both side on (c) part and (d) part.

If the paper is difficult to insert, cut the end of the paper into triangle shape.

(v) Align the paper and push the lever (1) down. Press the [FEED] (4) switch to secure the paper. The recorder paper can be fed manually by knob (5).

(vi) Lower the lever after making a fit to fit the paper. Slowly push the printer back in until it locks with a click.

(vii) Resume printing by turning the [PRINT] (2) switch on.

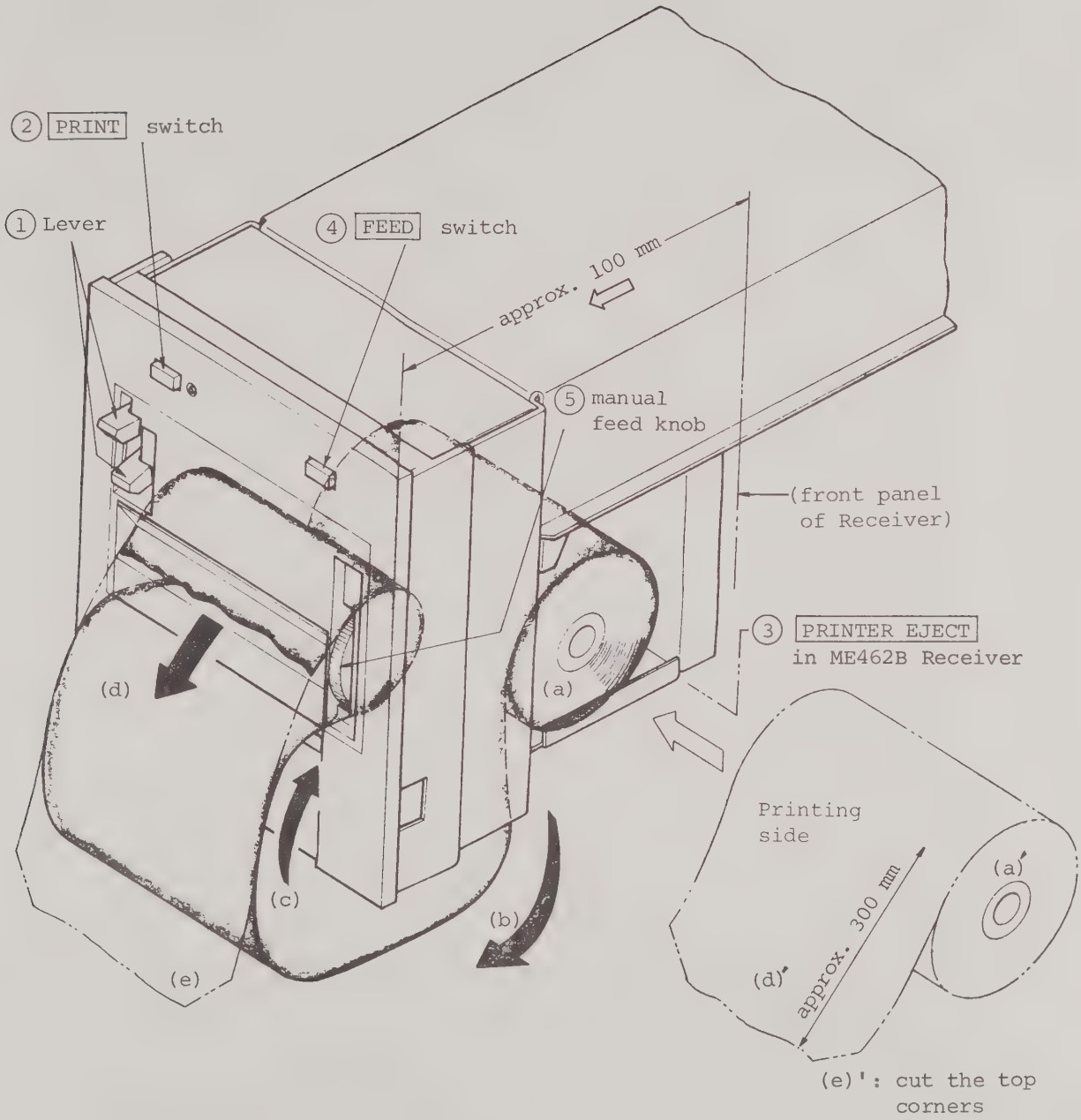


Fig. 4-32 Replenishment of the Recording Paper

OPERATION MANUAL

ME462B GP-IB INTERFACE

OPTION 21 (TRANSMITTER)
OPTION 31 (RECEIVER)

ANRITSU ELECTRIC CO., LTD.

Tokyo, Japan

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SECTION 1

GENERAL

The GP-IB (General Purpose Interface Bus) interface is provided as optional equipment with the DS-3 Transmission Analyzer ME462B.

The GP-IB is a standard interface bus specified in IEEE-488 (Institute of Electrical and Electronics Engineers) and IEC-625 (International Electrotechnical Commission).

Except for the POWER switch and PANEL LOCK switch, the GP-IB enables all ME462B functions on the front panel to be controlled remotely.

Thus, by connecting the ME462B to a personal computer or another measuring device, a flexible system can easily be configured.

The electrical characteristics of OPT 21 and OPT 31 are exactly the same, they are differentiated only to simplify the placing of orders. Thus, OPT 21 can also be used in the RECEIVER and OPT 31 can also be used in the TRANSMITTER.

SECTION 2

COMPOSITION AND SPECIFICATIONS

2.1 Composition

Table 2-1 Standard composition

Item	Name	Q'ty	Remarks
Unit	GP-IB Interface	1	For OPT 21 (option number of ME462B Transmitter) or OPT 31 (option number of ME462B Receiver) Both of which are the same.
Acces-sories	Operation manual	1	Follows the part for operation manual of DS-3 TRANSMISSION ANALYZER ME462B as option of it.

Table 2-2 Optional composition

Item	Name	Q'ty	Remarks
Optional Accessories	GP-IB Cable 2 m	1	(separate account)

2.2 Specifications

Item	Remarks
Interface	Conformity with IEEE Standard 488-1978.
Interface functions	SH1 : Source handshake function provided AH1 : Accept handshake function provided T5 : Talker function, talk only function, serial polling function, by MLA talker reset function provided. L3 : Listener function, listen only function, by MTA listener reset function provided. SP1 : Serial polling function provided RL1 : Remote/Local function provided PP0 : Parallel polling function not provided DC1 : Device clear function provided DT1 : Device trigger function provided (Receiver only) C0 : Controller function not provided
Settable items by GP-IB	All items on the front panel excluding the POWER and PANEL LOCK switches
Address	Address numbers 0 to 30, Talker only mode and Listener only mode
Connector for GP-IB	24 pin connector
Ambient temperature, rated range of use	0 to 50°C

SECTION 3

OPERATION

3.1 Installing the GP-IB Interface Unit

Precaution : Before installing (or removing) the units, turn the POWER switch off.

Procedures :

① Remove the 4 screws.

② Remove the blind board.

③ Install the GP-IB interface unit by the guide rails.

Note: When removing the unit to be repaired or replacing it to the INTERFACE unit, the INTERFACE connector of the unit must be connected to the cable connector to pull off both. And then remove the unit.

④ Fasten the 4 screws.

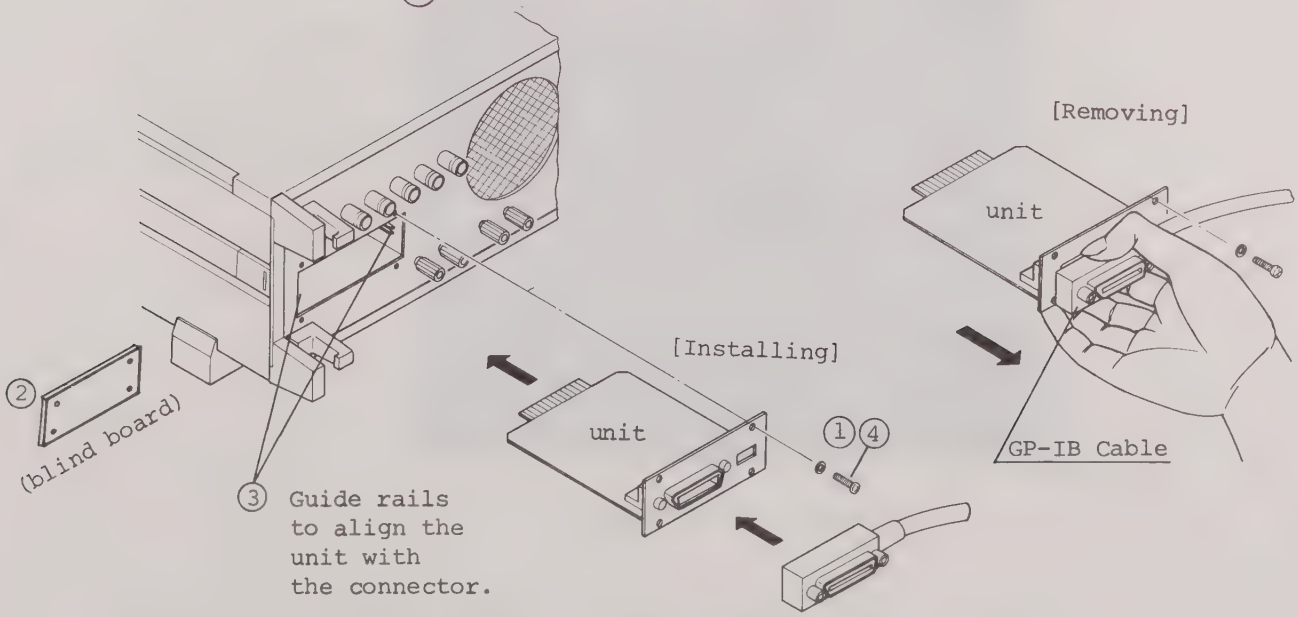


Fig. 3-1 Installing the GP-IB Interface Unit

3.2 Preparing for Measurement

Figure 3-2 is an example of the GP-IB interface configuration.

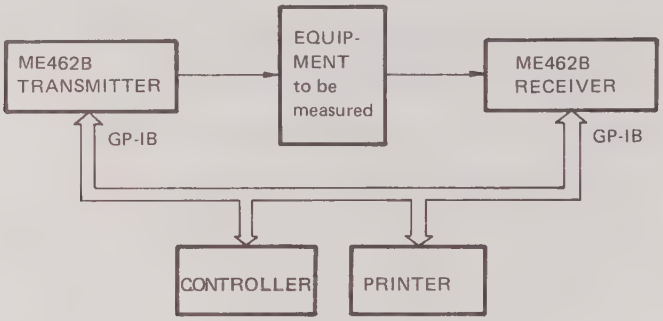


Fig. 3-2 Example of GP-IB interface configuration

3.2.1 Setting Addresses

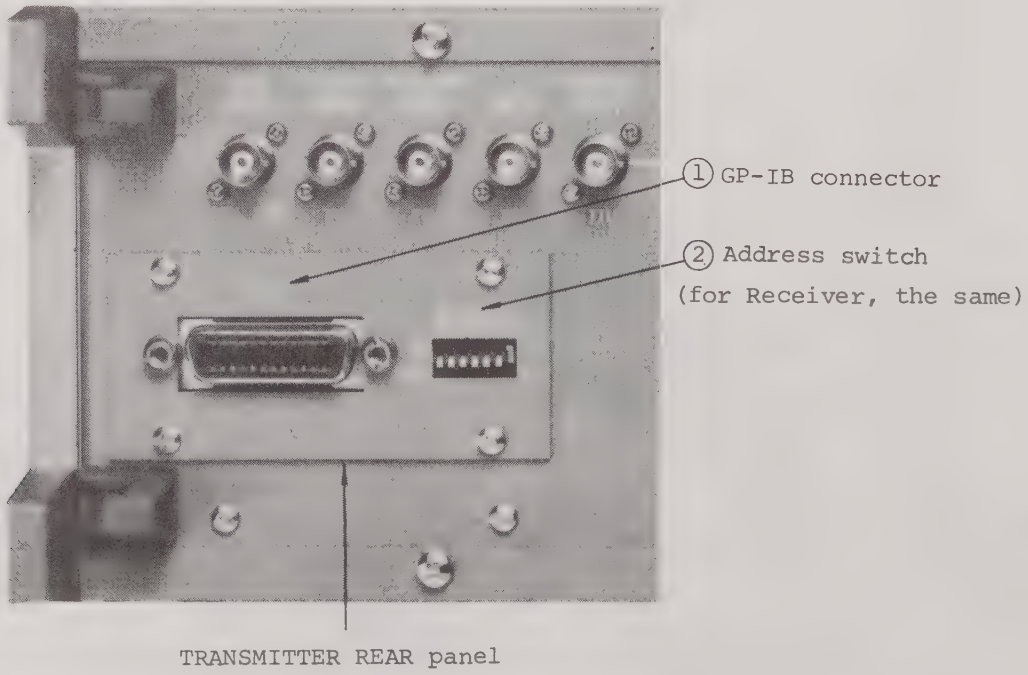


Fig. 3-3 Setting Address on the Rear Panel

For operating instruments by using the GP-IB interface, address must be set. The address of the ME462B is set by the switch (2) as shown in Fig. 3-3.
The ME462B verifies the address only when the power switch is turned on. Therefore, for every time of changing address, the power switch of the ME462B must be turned OFF once, and then turned ON to be verified.

In Fig. 3-4, switches A1 to A5 have the following value:

2^0 = 1 for A1,
2^1 = 2 for A2,
2^2 = 4 for A3,
2^3 = 8 for A4,
2^4 = 16 for A5

Fig. 3-4 Example of Address Setting

In the example of Fig. 3-4, the address 3 is valid.

An address can be set between 0 to 30 (31 cannot be used).

The two switches LON and TON on the left are used for setting LISTEN ONLY mode and TALK ONLY mode. When the LON switch is ON, LISTEN ONLY mode is performed. When the TON switch is ON, TALK ONLY mode is performed.

For setting LISTEN ONLY or TALK ONLY mode, address switch A1 to A5 are not effective.

3.2.2 Listen Only and Talk Only

LISTEN ONLY mode is used as shown in Fig. 3-5. Data is only received from the controller. It cannot be transmitted.

Therefore, this mode is useful when only setting the ME462B switches.

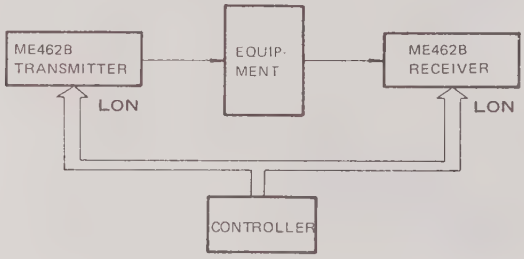
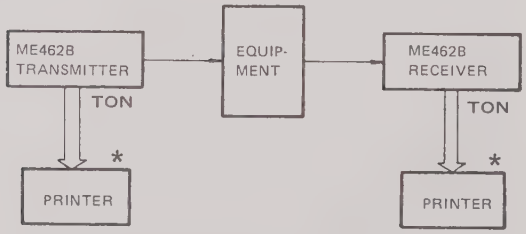


Fig. 3-5 Configuration Example for LISTEN ONLY MODE



* Printers should be set to LISTEN ONLY mode.

Fig. 3-6 Configuration Example for TALK ONLY MODE

TALK ONLY mode is used as shown in Fig. 3-6. This mode is used for only collecting data.

3.2.3 Setting Switches

The ME462B switches can be set by inputting the control messages shown in Tables 3-1 and 3-2. All codes are ASCII codes. Any number of measurement items can be set. Although most of the codes can be set in any order, the order of some of them must be considered. For example, when INPUT of the ME462B RECEIVER is set to UNIPOLAR, the BIPOLAR V code sent from the controller is ignored. Therefore, when changing the switch selection from [INPUT --- UNIPOLAR, ERROR --- BIT] to [INPUT --- DS-3 HIGH, ERROR --- BIPOLAR V], the INPUT specification code must come first.

Items that are not set retain their previous settings. Undefined codes are ignored.

Some of the functions specified by the DIP switch on the rear panel of the ME462B RECEIVER can be remotely controlled. After power on, the ME462B RECEIVER operates as specified by the DIP switch until a code is received from the controller. When a code is received from the controller, the ME462B operates as specified by the code. Therefore, note that the actual operation of the ME462B RECEIVER may differ from that specified by the DIP switch.

Table 3-1 ME462B TRANSMITTER control messages

Item			Code	Remarks	Refer to 3.2.4 (1)
CLOCK	INTERNAL		CI	The uninstalled F1 to F4 codes are ignored.	SW1
	EXTERNAL		CE		
	F1		CA		
	F2		CB		
	F3		CC		
	F4		CD		
CLOCK	JITTER MODULATION	OFF	JF	When CLOCK is not INTERNAL, JE or JI code is ignored.	SW2
		EXT	JE		
		INT	JI		
FRAME	ON		FO		SW3
	OFF		FF		
PATTERN	PRBS		PA		SW4
	1111		PB		
	1100		PC		
	1010		PD		
ERROR ADDITION	OFF		EF		SW5
	INTERNAL BIT	10^{-2}	B2	After being set once, errors are added continuously, except for SINGLE.	
		10^{-3}	B3		
		10^{-4}	B4		
		10^{-5}	B5		
		10^{-6}	B6		
		10^{-7}	B7		
		10^{-8}	B8		
		10^{-9}	B9		
		SINGLE	BS		

Table 3-1 ME462B TRANSMITTER control messages (Cont'd)

Item			Code	Remarks	Refer to 3.2.4 (1)
ERROR ADDITION (Cont'd)	INTERNAL BIPOLAR VIOLATION	10^{-2}	V2	When PATTERN is not PRBS, these codes are ignored. After being set once, errors are added continuously, except for SINGLE.	SW5 (Cont'd)
		10^{-3}	V3		
		10^{-4}	V4		
		10^{-5}	V5		
		10^{-6}	V6		
		10^{-7}	V7		
		10^{-8}	V8		
		10^{-9}	V9		
		SINGLE	VS		
	EXTERNAL		EB		
DS-3 OUTPUT LEVEL	HIGH		OA		SW6
	DSX-3		OB		
	LOW		OC		

Table 3-2 ME462B RECEIVER control message

Item			Code	Remarks	Refer to 3.2.4 (2)
INPUT*	DS-3	HIGH	IA		SW1
		DSX-3	IB		
		LOW	IC		
		DSX-3 LOW	ID		
	UNIPOLAR		IE		
FRAME*	ON		FO		SW2
	OFF		FF		
PATTERN*	PRBS		PA		SW3
	1111		PB		
	1100		PC		
	1010		PD		
DISPLAY	REAL TIME	YM	RY		-
		DHMS	RD		
	MEASURING TIME	TIME	MT		
		CLOCK	MC		
	MODE	TIMED	MM		
		ELAPSED	ME		
SET*	REAL TIME	YEAR	SY□□	□□ indicates 2-digit numbers. Ex. 1. The year 1983: SY83 Ex. 2. 8 o'clock : SH08 0 month or 25 o'clock etc. is ignored.	-
		MONTH	SO□□		
		DAY	SD□□		
		HOUR	SH□□		
		MINUTE	SM□□		
		SECOND	SS□□		
	MEASURING TIME	DAY	TD□□	□□ indicates 2-digit numbers. Ex. 1. 45 days : TD45 Ex. 2. 8 minutes: TM08 25 o'clock or 65 minutes etc. is ignored.	-
		HOUR	TH□□		
		MINUTE	TM□□		
		SECOND	TS□□		
		CLOCK	TC□□	□□ indicates numbers from 07 to 12. Ex. 1. 10^{7} : TC07 Ex. 2. 10^{12}: TC12	

* When the control messages marked with an asterisk are received, measurement is stopped.

Table 3-2 ME462B Receiver control message (Cont'd)

Item		Code	Remarks	Refer to 3.2.4 (2)
MEASURING MODE*	UNTIMED	MU		SW4
	SINGLE	MS		
	REPEAT	MR		
MEASURING	START	ST		-
	STOP*	SP		
HISTORY RESET		HR		-
CURRENT DATA	ON	CO		SW5
	OFF	CF		
MODE*	IN SERVICE	SI	The FRAME is set automatically when IN SERVICE is set.	SW6
	OUT OF SERVICE	SU		
ERROR	BIT	EB	BIT cannot be set when MODE is IN SERVICE. BIPOLAR VIOLATION cannot be set when INPUT is UNIPOLAR. PARITY cannot be set when FRAME is OFF. (Each retain its previous state.)	-
	PARITY	EP		
	BIPOLAR VIOLATION	EV		
DISPLAY	ERROR SECONDS	ES		-
	ERROR FREE SECONDS	EF		
	TOTAL ERRORS	ET		
	ERROR RATE	ER		
BUZZER	ON	BO		SW7
	OFF	BF		
MONITOR INPUT	ON	VO		-
	OFF	VF		
	The MINIMUM value is printed.	VL		
	The MAXIMUM value is printed.	VH		
	REF V STORE	VS□□□	□□□ indicates 3-digit numbers. Ex. 1. 0.5 Volt: VS 005 Ex. 2. 19.9 Volt: VS 199	

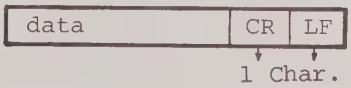
* When the control messages marked with an asterisk are received, measurement is stopped.

Table 3-2 ME462B Receiver control message (Cont'd)

Item			Code	Remarks	Refer to 3.2.4 (2)
DATA OUTPUT REQUEST			PM	The Receiver outputs the intermediate measurement and analysis data. When the printer mentioned below is in PRINT ON mode, the Receiver outputs concurrently the same data at the printer.	-
ERROR SECONDS	SYNCHRONOUS		DS		SW8
	ASYNCHRONOUS		DA		
PRINTER (option of ME462B Receiver)	PRINT	ON	PO	PRINT goes off automatically when control is changed from local to remote.	SW9
		OFF	PF		
	PAPER FEED		PP	Feeds one line by one command.	-
	NORMAL printing		PN		
	REVERSE printing		PR		
	MANUAL PRINT		PM	When PRINT is OFF, code PM is ignored. Output is also done at the GP-IB line when the PM code is received.	

3.2.4 Data Output

Carriage Return (CR) and Line Feed (LF) are added after all data is output.

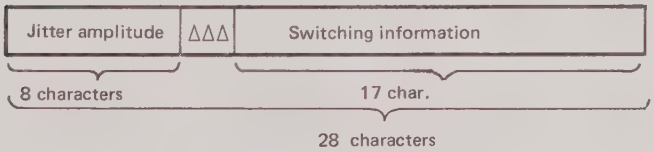


(Note) The number of Δ marks shows the columns to be blanked.

(1) Transmitter

(i) Output format

The output format is as follows:



- Jitter amplitude is output as follows:

  (a) When JITTER MODULATION is on:

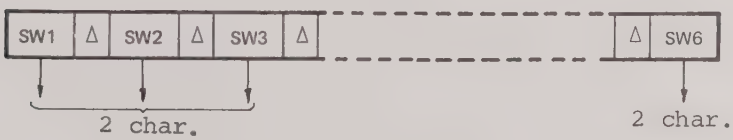
  [0.01 BIT Δ] to [9.99 BIT Δ], [10.0 BIT Δ] to [16.2 BIT Δ], [OVERFLOW] for 16.3 or more bits.

  (b) When JITTER MODULATION is set off:

  [- - - - - - - - -]

- Switching information is output as follows:

The codes in Table 3-1 are shown in the positions of SW n.



o Example of output format;

When	CLOCK	:	44.736 M
	JITTER MODULATION	:	ON
	FRAME	:	ON
	PATTERN	:	PRBS
	ERROR ADDITION	:	INTERNAL BIT
	ERROR RATE	:	10^{-6}
	DS-3 OUTPUT LEVEL	:	DSX-3
	JITTER AMPLITUDE	:	14.2 BIT

[14.2BIT CI JO FO PA B6 OB]

(ii) Data output timing

When [JITTER MODULATION] is set at [EXT] or [INT], data is output each time the jitter amplitude is measured (about 0.7 second) or when a switching is made (See Fig. 3-7).

When [JITTER MODULATION] is set at [OFF], output is done only when a switching is made. In either case, a service request (SRQ, see Fig. 3-8) is sent before the data is sent so that whether data has been sent can be known by monitoring the SRQ bit.

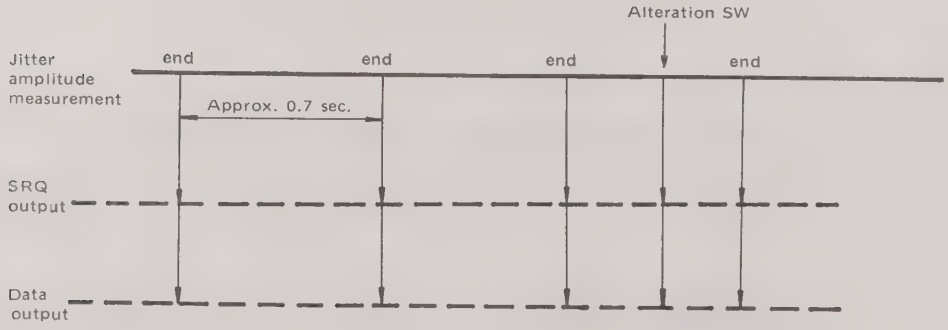


Fig. 3-7 TRANSMITTER Data Output Timing

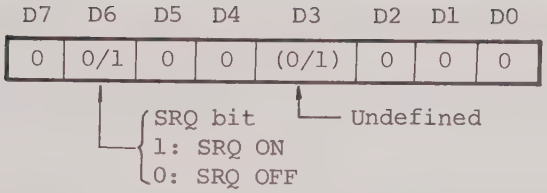


Fig. 3-8 TRANSMITTER Status Byte

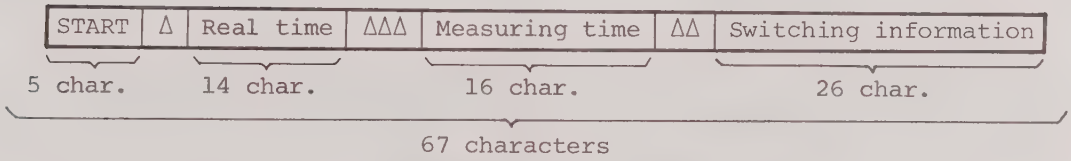
(2) Receiver

(i) Output format

There are 4 types of output formats as shown in following ① to ④.

① Measurement condition output

This is output when measurement starts.



- Real time is output as follows:

[SEP02/15 : 10 : 42]
Day Minute
Month Hour Second

- Measuring time is output as follows

(a) When measuring time is TIME:

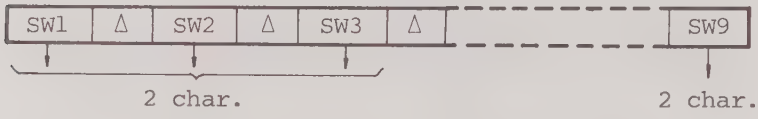
[TIMEΔ30 / 00 : 00 : 00]
Day Minute
Hour Second

(b) When measuring time is CLOCK:

[CLOCKΔE08ΔΔΔΔΔΔΔ] (example of 10^{+8})

- Switching information is output as follows:

  The codes in Tabel 3-2 are shown in the positions of SW n.



o Example of output format;

When
```
REAL TIME     :  OCT 20/12:34:56
MEAS TIME     :  1 hr
INPUT         :  DSX-3
FRAME         :  ON
PATTERN       :  PRBS
MEASURING     :  REPEAT
CURRENT DATA  :  ON
MODE          :  OUT OF SERVICE
BUZZER        :  OFF
ERROR SECOND  :  SYNCHRONOUS
PRINT         :  OFF
```

```
START OCT20/12:34:56   TIME 00/01:00:00  IB FO PA MR
```

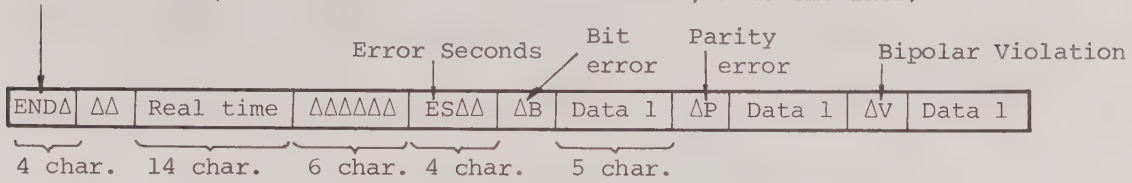
(cont'd)
```
CO SU BF DS PF
```

② Measurement and analysis data output

Output is done when a measurement is completed or when there is a request for data output (code is PM), and every two hours when the measuring time is set for up to 48 hours, or daily when the measuring time is set for over 48 hours.

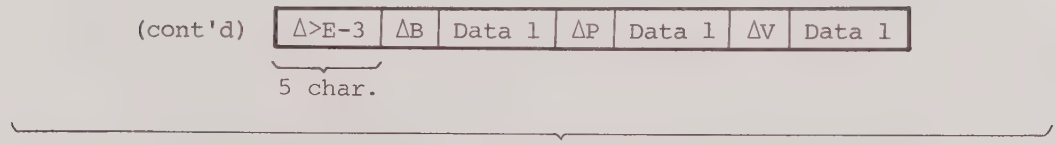
First line

ENDΔ or INT. (When measurement is ended: ENDΔ, Interim: INT.)



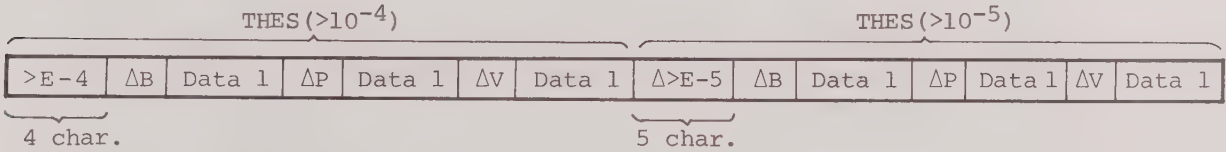
Threshold ES when the error rate exceeds 10^{-3}

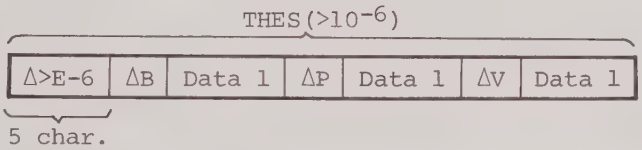
[Hereafter written in the form of THEFS(>10^{-3})].



77 characters

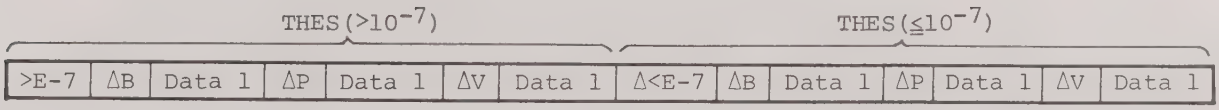
Second line

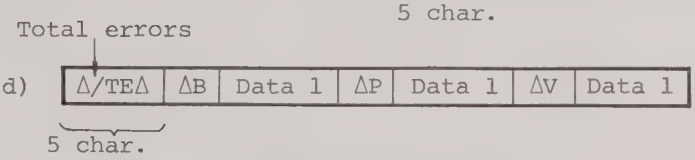




77 characters

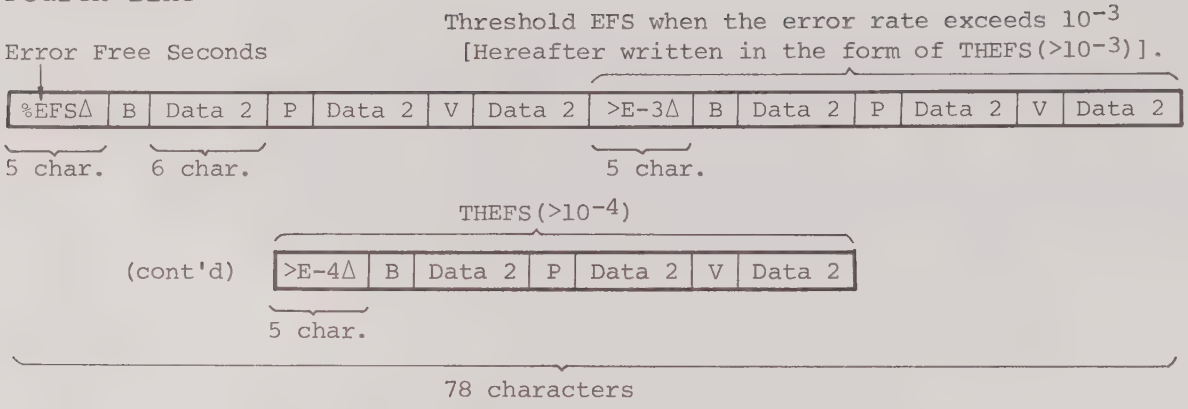
Third line



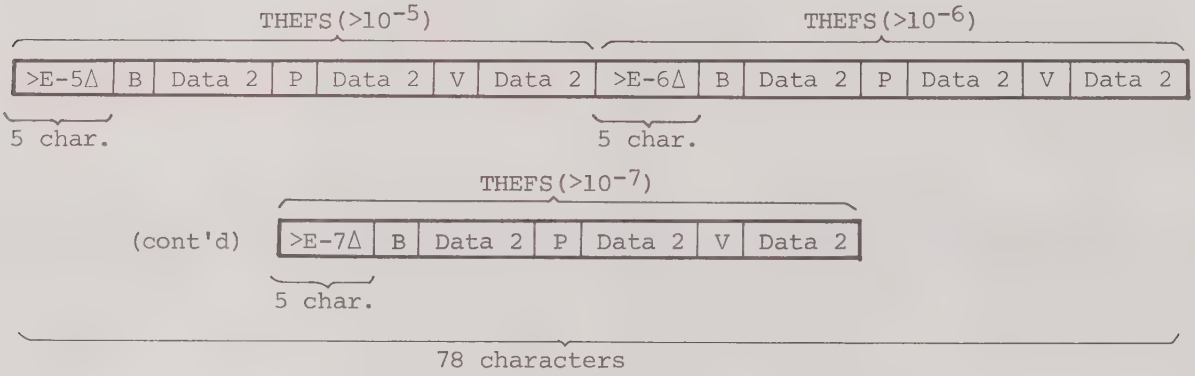


77 characters

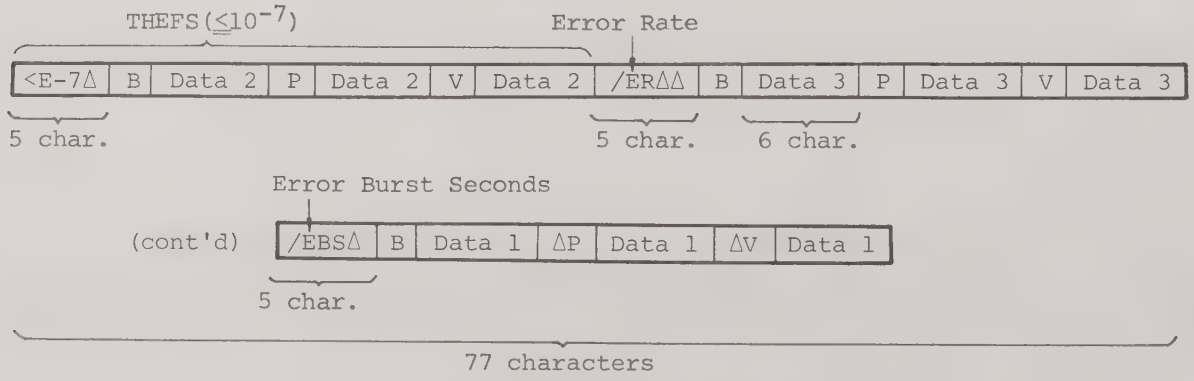
Fourth line


Error Free Seconds
Threshold EFS when the error rate exceeds 10^{-3}
[Hereafter written in the form of THEFS(>10^{-3})].
%EFSΔ B Data 2 P Data 2 V Data 2 >E-3Δ B Data 2 P Data 2 V Data 2
5 char.
6 char.
5 char.
THEFS(>10^{-4})
(cont'd)
>E-4Δ B Data 2 P Data 2 V Data 2
5 char.
78 characters

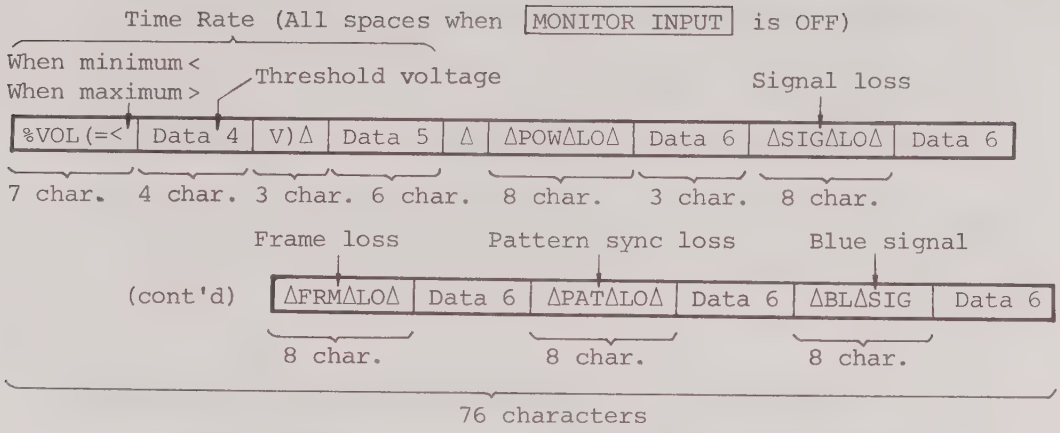
Fifth line


THEFS(>10^{-5})
THEFS(>10^{-6})
>E-5Δ B Data 2 P Data 2 V Data 2 >E-6Δ B Data 2 P Data 2 V Data 2
5 char.
5 char.
THEFS(>10^{-7})
(cont'd)
>E-7Δ B Data 2 P Data 2 V Data 2
5 char.
78 characters

Sixth line


THEFS(≤10^{-7})
Error Rate
<E-7Δ B Data 2 P Data 2 V Data 2 /ERΔΔ B Data 3 P Data 3 V Data 3
5 char.
5 char.
6 char.
Error Burst Seconds
(cont'd)
/EBSΔ B Data 1 ΔP Data 1 ΔV Data 1
5 char.
77 characters

Seventh line



- Real time is output as follows:

  [SEP02 / 15 : 10 : 42]
  Month Day Hour Minute Second

- Data 1 is output as follows:

  [00000] to [99999] to [1.0 + 5] to [9.9+9]

  [ΔOFLΔ] for over 1.0×10^{10}

  However, the unmeasured errors are displayed as [-----].

- Data 2 is output as follows:

  [00.000] to [99.999] to [ΔΔΔ100]

  However, the unmeasured errors are displayed as [------].

- Data 3 is output as follows:

  [0.0-15] (example of 0.0×10^{-15})
  to [9.9-02] (example of 9.9×10^{-2})

  [ΔOFLΔΔ] for over 1.0×10^{-1}.

  However, the unmeasured errors are displayed as [------].

- Data 4 is output as follows:

  [Δ0.0] to [Δ0.1] to [20.0]

- Data 5 is output as follows:

  [00.000] to [99.999] to [ΔΔΔ100]

- Data 6 is output as follows:

  [000] to [999]
  [OFL] for 1000 or more

  However, the alarms not required for the measurement are displayed as [---].

o Example of output format;

First line

```
END   MAY01/10:00:00      ES   B00025 P00025
(cont'd)     V00026 >E-3 B00004 P00000 V00013
```

Second line

```
>E-4 B00006 P00006 V00015 >E-5 B00010 P00010
(cont'd)     V00017 >E-6 B00015 P00015 V00023
```

Third line

```
>E7 B00022 P00022 V00024 <E-7 B00003 P00003
(cont'd)   V00002 /TE  B1.3+6 P47438 V3.5+6
```

Fourth line

```
%EFS B99.942P99.942V99.939E>-3 B99.990P   100
(cont'd)    V99.969E>-4 B99.986P99.986V99.965
```

Fifth line

```
>E-5 B99.976P99.976V99.960E>-6 B99.965P99.965
```

(cont'd)

```
V99.946E>-7 B99.949P99.949V99.944
```

Sixth line

```
<E-7 B99.993P99.993V99.995/ER  B7.2-07P2.4-08
```

(cont'd)

```
V1.8-06/EBS B00013P00013 V 00021
```

Seventh line

```
%VOL(=< 0.7V) 47.516  POW LO 000 SIG LO 004
```

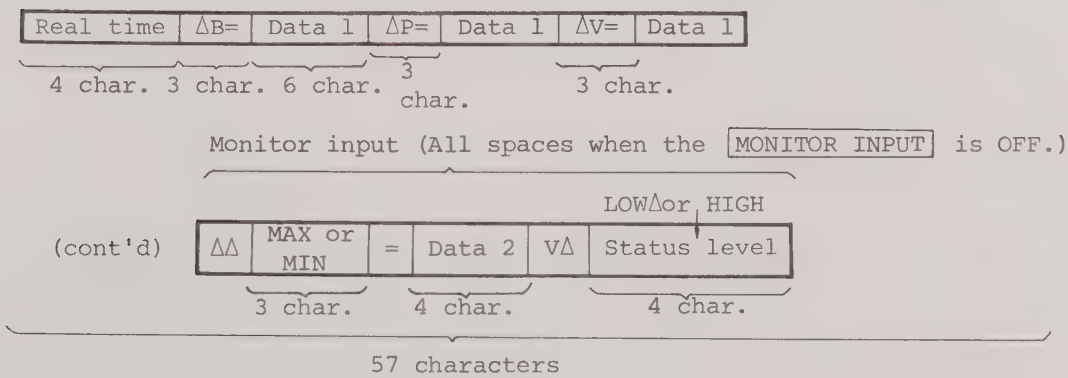
(cont'd)

```
FRM LO 000 PAT LO 002 BL SIG 000
```

③ Error outputs

Note that the error outputs, like the built-in printer (OPT 11), are controlled by the DIP switch on the rear panel (see Section 3.4.2(3) of ME462B Main Frame Operation Manual for details).

Also note that when the printer form save (see Section 3.4.2(2) of the above manual) is ON, up to 10 consecutive errors are output, but the 11th and subsequent errors are not output, which is similar to that of the printer. To output the 11th and subsequent errors, turn the form save switch OFF.



- Real time is output as follows:

  [SEP02/15:10:42]
  Month Day Hour Minute Second

- Data 1 is output as follows:

  [0.0-15] (example of 0.0×10^{-15})
  to [9.9-02] (example of 9.9×10^{-2})
  [ΔOFLΔΔ] for over 1.0×10^{-1}.

  However, the unmeasured errors are displayed as [------].

- Data 2 is output as follows:

  [Δ0.0] to [20.0]

o Example of output format;

APR10/12:00:05 B=3.1-06 P=1.0-07 V=5.6-07 MIN=10.2V HIGH

④ Alarm data output

This data is output when an alarm occurs or when a recovery is made.

[Characters 1]	ΔΔΔ	Real time	ΔΔΔ	[Characters 2]
5 char.		14 char.		11 char.

36 characters

· [Character 1] are output as shown in Table 3-3.

Table 3-3 Characters 1

Alarm	Occurrence	Recovery
Signal loss	NS1**	NS0**
Frame loss	FL1**	FL0**
Pattern sync loss	PL1**	PL0**
Blue signal	BS1**	BS0**

· Real time is output as follows:

[SEP02/15:10:42]
Day Minute
Month Hour Second

· [Character 2] are output as shown in Table 3-4.

Table 3-4 Characters 2

Alarm	Occurrence	Recovery
Signal loss	SIGNALΔLOSS	SIGNALΔGAIN
Frame loss	FRAMEΔΔLOSS	FRAMEΔΔGAIN
Pattern sync loss	PATΔSYΔLOSS	PATΔSYΔGAIN
Blue Signal	BLUΔSIGΔDET	BLUΔNOTΔDET

o Example of output format;

Signal loss

At occurrence

NS1** MAY15/10:21:40 SIGNAL LOSS

At recovery

NS0** MAY15/10:21:42 SIGNAL GAIN

(ii) Data output timing

The timing for data output is shown in Fig. 3-9. The numbers ① to ④ in the figure correspond to the data of the four output formats explained in section 3.2.4 (2) (i).
Since a service request (SRQ, see Fig. 3-10) is sent out just before the data, the data can be known by monitoring the SRQ bit.

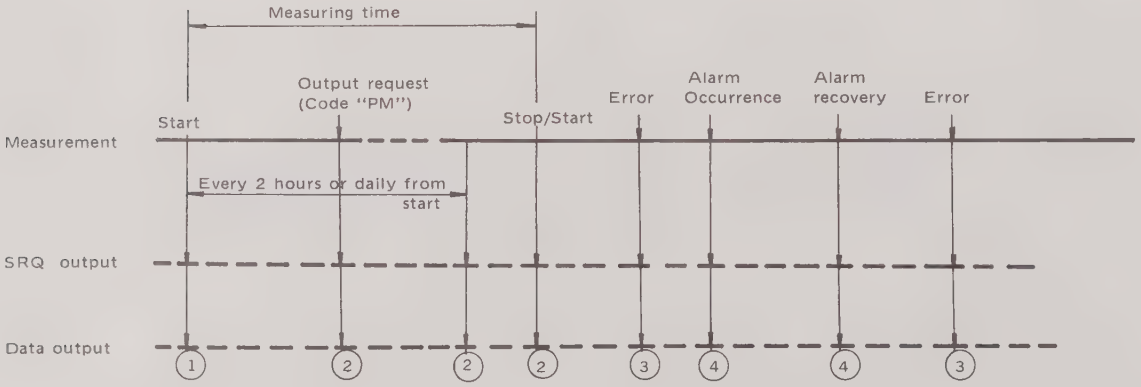


Fig. 3-9 RECEIVER data output timing

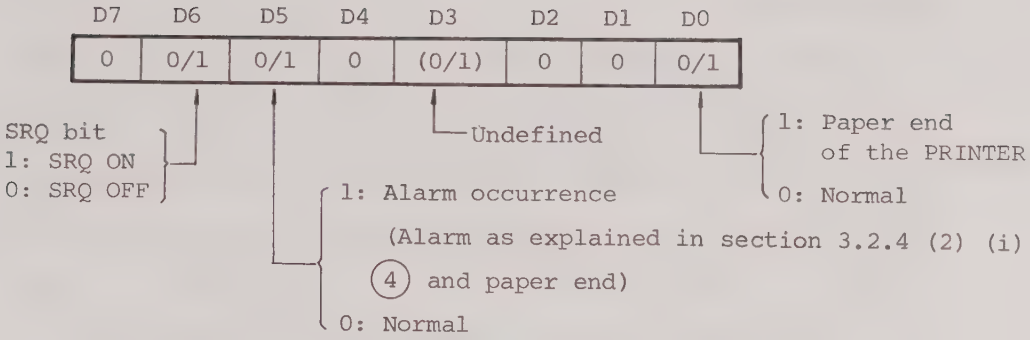

D7 D6 D5 D4 D3 D2 D1 D0
0 0/1 0/1 0 (0/1) 0 0 0/1
SRQ bit
1: SRQ ON
0: SRQ OFF
Undefined
1: Paper end of the PRINTER
0: Normal
1: Alarm occurrence
(Alarm as explained in section 3.2.4 (2) (i) ④ and paper end)
0: Normal

Fig. 3-10 RECEIVER Status Byte

3.3 Measurement

Two examples are shown on parallel. On the left side, the Anritsu Packet II personal computer is presented as a controller, and on the right side, the HP-85 personal computer is shown as a controller. Provide a printer which has a GP-IB interface and which can print 80 characters or more (example: Anritsu DPR7713A).

The address of the ME462B TRANSMITTER is [01]. The address of the ME462B RECEIVER is [02].

Note: When the power supply of the ME462B is restored after being turned OFF, the ME462B is set to local state.

3.3.1 Examples of Settings

Example; For setting the CLOCK in the transmitter to 44.736M:

Packet II	HP-85
WRITE @ 1 0 1 : "CI"	OUTPUT 7 0 1 : "CI"

[01] ; Address of the ME462B TRANSMITTER

For transmitting two or more commands, mark them off by commas.

Example ; For setting the PATTERN in the receiver section to [PRBS] and the FRAME to [OFF]:

WRITE @ 1 0 2 : "PA, FF"	OUTPUT 7 0 2 ; "PA, FF"

[02] ; Address of the ME462B RECEIVER

3.3.2 Examples of Reading Data

Packet II	HP-85
READ @ 1 0 2 : A$	ENTER 7 0 2 ; A$

Data is read in A$ in the character string format.

The following examples show reading the printing data.

Packet II	HP-85
10 DIM A$*100	10 DIM A$ [100]

Commands for being all to use characters of 100 maximum.

20 WRITE @ 1 0 2 : "ST"	20 OUTPUT 7 0 2 ; "ST"
30 READ @ 1 0 2 : A$	30 ENTER 7 0 2 ; A$
40 WRITE @ 1 0 3 : A$	40 OUTPUT 7 0 3 ; A$
[03] ; Address of the printer	
50 GO TO 30	50 GO TO 30
60 END	60 END

3.3.3 Example Program

An example program using SRQ is given. ME462B data can be received and printed by using SRQ while normally performing other jobs, for example, data analysis, plotting, and control of other measuring equipment, only when ME462B data is output.

The switches are set as follows:

- TRANSMITTER

  44.736M | JITTER MODULATION OFF | FRAME ON | PRBS | ERROR ADDITION OFF | DSX-3

· RECEIVER

[DSX-3] [FRAME ON] [PRBS] [TIMED] [REPEAT]

[CURRENT DATA OFF] [OUT OF SERVICE] [BIT] [ERROR SECONDS]

[BUZZER OFF] [MONITOR INPUT OFF] [ERROR SECONDS SYNCHRO-NOUS] [PRINT OFF]

1) The Explanation for [Packet II] is described at first.

```
10  DIM A$*100
20  WRITE @ 101 : "CI, JF, FO, PA, EF, OB"
```

This sets the TRANSMITTER.

```
30  WRITE @ 102 : "IB, FO, PA, MM, MR, CF, SU, EB, ES, BF,
                   VF, DS, PF, TD01"
```

This setting is for the RECEIVER. TD01 sets one day for the measuring time. After receiving this command, the ME462B RECEIVER stops measurement.

```
40  DCL @ 102
```

Resets the RECEIVER. This clears all previous data remaining in the RECEIVER. At the same time, a lamp test is made for about three seconds.

```
50  WRITE @ 102 : "ST"
```

The ME462B RECEIVER starts measurement.

```
60  STATUS @ 102 : S
```

Resets interrupts if generated before.

```
70  READ @ 101 : A$
```

Reads the switch information of the TRANSMITTER.

```
80  WRITE @ 103 : A$
            └──[03]; Address of the printer
```

```
 90  PROCESS EVENT GPIB "@01, 02"
```

Defines the interrupt signal (SRQ).

```
100  START GPIBSRQ
```

Enables the commands (200 to 270) used for interrupts.

```
110  CONNECT EVENT GPIB
```

Permits interrupts. When an interrupt occures after this, the job skips to 200.

```
120  GO TO 120
```

If some expected commands are necessary, insert them at this position.

```
130  END
200  PARACT GPIBSRQ URGENCY 50
```

Declares the following commands as subroutine used for interrupts.

```
210  DIM B$*100
220  WAIT EVENT GPIB
```

Waits for an interrupt occurrence. 120 is processed until an interrupt occurs. After an interrupt occurs, 230 and the following commands are processed.

```
230  STATUS @ 102 : S
```

Performs interrupt processing. The status byte is written in the position of characters S.

```
240  READ @ 102 : B$
250  WRITE @ 103 : B$
260  GO TO 220
```

Waits for the next interrupt.

```
270  END PARACT
```

The explanation for [HP-85] is described, as follows.

```
10  DIM A$[100]
20  OUTPUT 701 ; "CI, JF, FO, PA, EF, OB"
30  OUTPUT 702 ; "IB, FO, PA, MM, MR, CF, SU, EB, ES, BF,
                  VF, DS, PF, TD01"
40  CLEAR 702
50  OUTPUT 702 ; "ST"
60  STATUS 7, 1; S
70  ENTER 701 ; A$
80  OUTPUT 703 ; A$
            └──[03]; Address of the printer
90  ON INTR 7 GOSUB 200
```

Specifies the address to skip to which the state for an interrupt occurrence.

```
100 ENABLE INTR 7 ; 8
```

Permits interrupts.

```
110 GO TO 110
120 END
200 S = SPOLL (702)
```

Performs interrupt processing and writes the status byte in S.

```
210 DIM B$[100]
220 IF BIT (S, 6) = 1 THEN GO TO 240
```

Distinguishes whether the interrupt request is sent from the ME462B RECEIVER.

```
230 ENABLE INTR 7 ; 8@ RETURN
```

```
240  ENTER 702 ; B$
250  OUTPUT 703 ; B$
260  ENABLE INTR 7 ; 8 @ RETURN
270  END
```

OPERATION MANUAL

ME462B RS-232C INTERFACE

OPTION 22 (TRANSMITTER)

OPTION 32 (RECEIVER)

ANRITSU ELECTRIC CO., LTD

Tokyo, Japan

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SECTION 1

GENERAL

The DS-3 transmission analyzer ME462B provides the RS-232C interface option, which comforms to the Electric Industries Association (EIA) standards.

Using the RS-232C interface enables remote control of all ME462B front panel switches except for the POWER switch and PANEL LOCK switch.

It also enables the ME462B to be connected to a modem and, by doing so, the user can control the ME462B and collect data at a place remote from the installation through the analog data line or dial line.

The user can also control the ME462B by a personal computer only if the computer employs the RS-232C interface.

Options 22 and 32 are order numbers assigned for the convenience of distingushing between the RS-232C interfaces for the transmitter and receiver. But these two options have exactly the same electrical specifications and the user can use option 22 for the receiver and option 32 for the transmitter.

SECTION 2

COMPOSITION AND SPECIFICATIONS

2.1 Composition

Table 2-1 Standrad composition

Item	Name	Q'ty	Remarks
Unit	RS-232C Interface	1	For OPT 22 (option number of ME462B Transmitter), or OPT 32 (option number of ME462B Receiver) Both of which are the same.
Acces-sory	Operation manual	1	

Table 2-2 Optional composition

Item	Name	Q'ty	Remarks
Optional Accessories	RS-232C Cable 2 m	1	(separate account) Cable for connecting to a modem. Figure 2-1 shows the RS-232C cable pin connections.
	DB-25P Connector	1	(separate account)

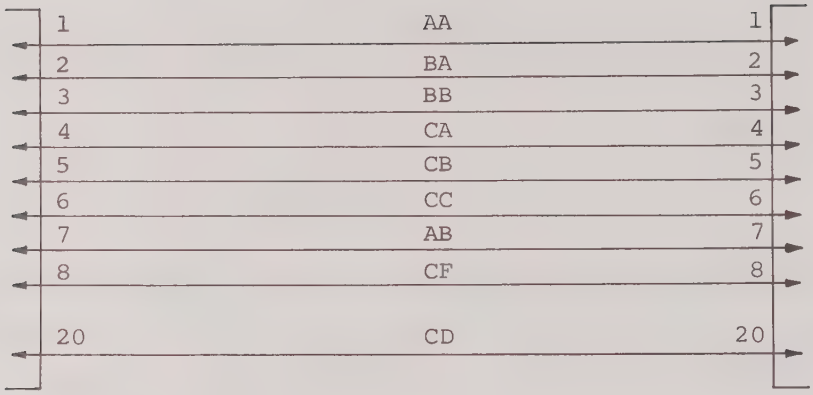


Fig. 2-1 RS-232C cable pin connections

2.2 Specifications

Item	Remarks	Setting before delivery
Interface	Conforms to the EIA standards.	——
Communication formula	Full Duplex Nonsynchronous	——
Baud rate	50, 75, 110, 134.5, 150, 300 600, 1200, 1800, 2000 bps (Selectable by the Baud Rate switch on the rear panel.)	300 bps
Character length	7 bits, 8 bits (Selectable by the internal switch.)	7 bits
Parity	Odd, even, none (Selectable by the internal switch.)	Odd
Number of start bits	1 bit	——
Number of stop bits	1 bit, 1½ bit, 2 bit (Selectable by the internal switch.)	1 bit
Settable items by RS-232C	All items on the front panel excluding the POWER and PANEL LOCK switches.	——

(Cont'd)

Item	Remarks	Setting before delivery
Connector	DB-25P	——
Ambient temperature rated range of use	0 to 50°C	——

SECTION 3

OPERATION

3.1 Installing the RS-232C Interface Unit

Precaution: Before installing (or removing) the units, turn the [POWER] switch off.

Procedures:

(1) Remove the 4 screws.

(2) Remove the blind board.

(3) Install the RS-232C interface unit by the guide rails.

Note: When removing the unit to be repaired or replacing it to the GP-IB INTERFACE unit, the RS-232C INTERFACE connector of the unit must be connected to the cable connector to pull off both. And then remove the unit.

(4) Fasten the 4 screws.

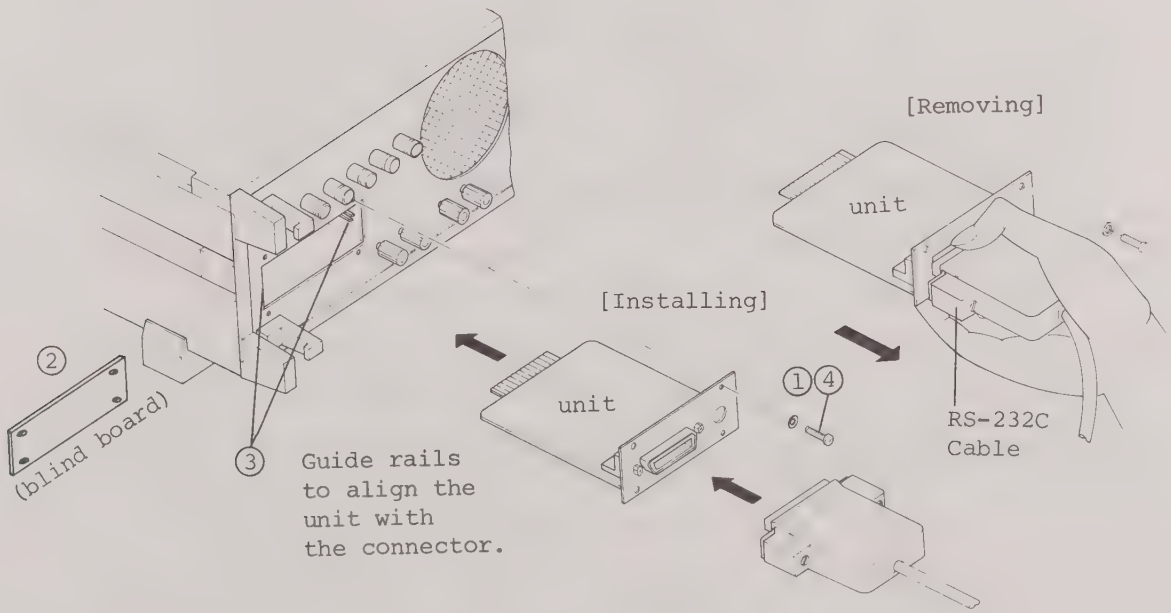
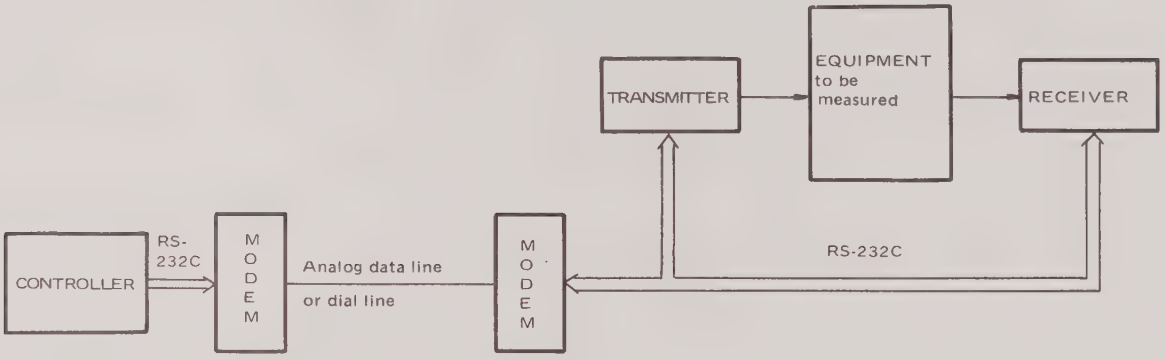


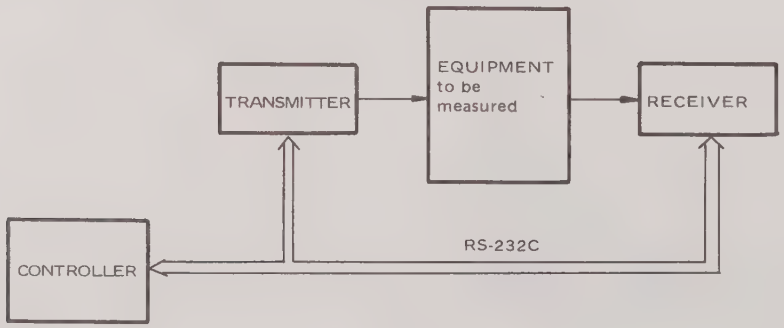
Fig. 3-1 Installing the RS-232C Interface Unit

3.2 Preparing for measurement

Figure 3-2 shows ME462B system configuration examples using the RS-232C interfaces.



(1) Configuration using modems (through the analog data line or dial line)



(2) Configuration for direct control by a controller

Fig. 3-2 ME462B system configuration examples by RS-232C

3.2.1 Setting rear panel and internal switches

(1) Rear panel switch

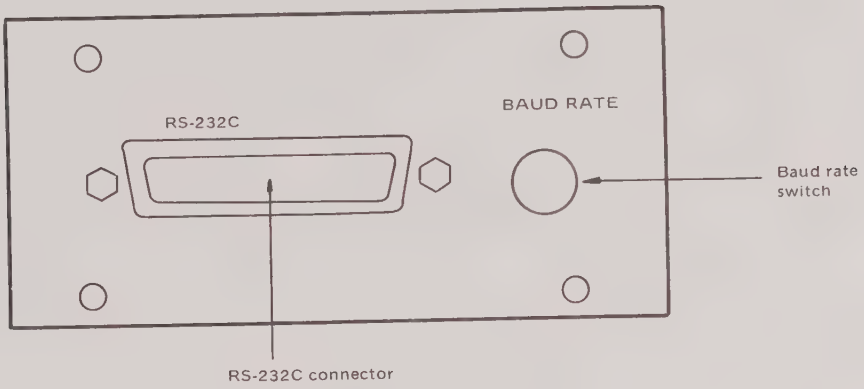


Fig. 3-3 RS-232C rear panel

Table 3-1 shows the correspondence between the numbers marked on the Baud Rate switch and baud rates.

Table 3-1 Correspondence between the numbers and baud rates

Number	0	1	2	3	4	5	6	7	8	9
Baud rate (bps)	50	75	110	134.5	150	300	600	1200	1800	2000

The Baud Rate switch can be set to the required baud rate by turning the arrow mark in the switch to the number corresponding to it. In the example below, the arrow mark is set to 5.

The ME462B verifies the baud rate only when the power switch is turned ON. Therefore, for every time of changing the baud rate, the power switch of the ME462B must be turned OFF once, and then turned ON to be verified.

(2) Internal switch

Figure 3-4 shows the location of the internal switch S1 and Table 3-2 shows the functions of the S1 switch bits.

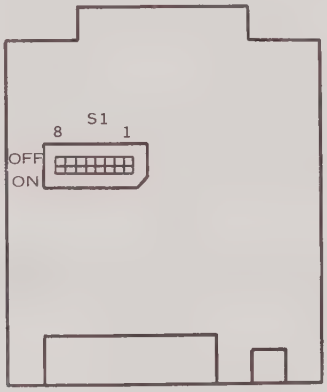


Fig. 3-4 Location of the internal switch

Table 3-2 S1 switch bit function

Switch (S1)

8	7	6	5	4	3	2	1

Number of stop bits

	8	7
1 bit	ON	ON
	ON	OFF
1 1/2 bit	OFF	ON
2 bit	OFF	OFF

Unused

Unused

Parity enable

Disable	ON
Enable	OFF

Character length

7 bit	ON
8 bit	OFF

Parity

Odd	ON
Even	OFF

All the bits are ON for shipping.

3.2.2 Setting Switches

The ME462B switches can be set by inputting the control messages shown in Tables 3-3 and 3-4. All codes are ASCII codes. Any number of measurement items can be set. Although most of the codes can be set in any order, the order of some of them must be considered. For example, when INPUT of the ME462B RECEIVER is set to UNIPOLAR, the BIPOLAR V code sent from the controller is ignored. Therefore, when changing the switch selection from [INPUT --- UNIPOLAR, ERROR --- BIT] to [INPUT --- DS-3 HIGH, ERROR --- BIPOLAR V], the INPUT specification code must come first.

Items that are not set retain their previous settings. Undefined codes are ignored.

Some of the functions specified by the DIP switch on the rear panel of the ME462B RECEIVER can be remotely controlled. After power on, the ME462B RECEIVER operates as specified by the DIP switch until a code is received from the controller. While a code is being received from the controller, the ME462B operates as specified by the code. Therefore, note that the actual operation of the ME462B RECEIVER may differ from that specified by the DIP switch.

Table 3-3 ME462B TRANSMITTER control messages

Item			Code	Remarks	Refer to 3.2.3 (1)
CLOCK	INTERNAL		CI	The uninstalled F1 to F4 codes are ignored.	SW1
	EXTERNAL		CE		
	F1		CA		
	F2		CB		
	F3		CC		
	F4		CD		
CLOCK	JITTER MODULATION	OFF	JF	When CLOCK is not INTERNAL, JE or JI code is ignored.	SW2
		EXT	JE		
		INT	JI		
FRAME	ON		FO		SW3
	OFF		FF		
PATTERN	PRBS		PA		SW4
	1111		PB		
	1100		PC		
	1010		PD		
ERROR ADDITION	OFF		EF		SW5
	INTERNAL BIT	10^{-2}	B2	After being set once, errors are added continuously, except for SINGLE.	
		10^{-3}	B3		
		10^{-4}	B4		
		10^{-5}	B5		
		10^{-6}	B6		
		10^{-7}	B7		
		10^{-8}	B8		
		10^{-9}	B9		
		SINGLE	BS		

Table 3-3 ME462B TRANSMITTER control messages (Cont'd)

Item			Code	Remarks	Refer to 3.2.3 (1)
ERROR ADDITION (Cont'd)	INTERNAL BIPOLAR VIOLATION	10^{-2}	V2	When PATTERN is not PRBS, these codes are ignored. After being set once, errors are added continuously, except for SINGLE.	SW5 (Cont'd)
		10^{-3}	V3		
		10^{-4}	V4		
		10^{-5}	V5		
		10^{-6}	V6		
		10^{-7}	V7		
		10^{-8}	V8		
		10^{-9}	V9		
		SINGLE	VS		
	EXTERNAL		EB		
DS-3 OUTPUT LEVEL	HIGH		OA		SW6
	DSX-3		OB		
	LOW		OC		

Table 3-4 ME462B RECEIVER control message

Item			Code	Remarks	Refer to 3.2.3 (2)
INPUT*	DS-3	HIGH	IA		SW1
		DSX-3	IB		
		LOW	IC		
		DSX-3 LOW	ID		
	UNIPOLAR		IE		
FRAME*	ON		FO		SW2
	OFF		FF		
PATTERN*	PRBS		PA		SW3
	1111		PB		
	1100		PC		
	1010		PD		
DISPLAY	REAL TIME	YM	RY		-
		DHMS	RD		
	MEASURING TIME	TIME	MT		
		CLOCK	MC		
	MODE	TIMED	MM		
		ELAPSED	ME		
SET*	REAL TIME	YEAR	SY□□	□□ indicates 2-digit numbers. Ex. 1. The year 1983: SY83 Ex. 2. 8 o'clock : SH08 0 month or 25 o'clock etc. is ignored.	-
		MONTH	SO□□		
		DAY	SD□□		
		HOUR	SH□□		
		MINUTE	SM□□		
		SECOND	SS□□		
	MEASURING TIME	DAY	TD□□	□□ indicates 2-digit numbers. Ex. 1. 45 days : TD45 Ex. 2. 8 minutes: TM08 25 o'clock or 65 minutes etc. is ignored.	-
		HOUR	TH□□		
		MINUTE	TM□□		
		SECOND	TS□□		
		CLOCK	TC□□	□□ indicates numbers from 07 to 12. Ex. 1. 10^7 : TC07 Ex. 2. 10^{12}: TC12	

* When the control messages marked with an asterisk are received, measurement is stopped.

Table 3-4 ME462B RECEIVER control message (Cont'd)

Item		Code	Remarks	Refer to 3.2.3 (2)
MEASURING MODE*	UNTIMED	MU		SW4
	SINGLE	MS		
	REPEAT	MR		
MEASURING	START	ST		-
	STOP*	SP		
HISTORY RESET		HR		-
CURRENT DATA	ON	CO		SW5
	OFF	CF		
MODE*	IN SERVICE	SI	The FRAME is set automatically when IN SERVICE is set.	SW6
	OUT OF SERVICE	SU		
ERROR	BIT	EB	BIT cannot be set when MODE is IN SERVICE. PARITY cannot be set when FRAME is OFF. BIPOLAR VIOLATION cannot be set when INPUT is UNIPOLAR. (Each retain its previous state.)	-
	PARITY	EP		
	BIPOLAR VIOLATION	EV		
DISPLAY	ERROR SECONDS	ES		-
	ERROR FREE SECONDS	EF		
	TOTAL ERRORS	ET		
	ERROR RATE	ER		
BUZZER	ON	BO		SW7
	OFF	BF		
MONITOR INPUT	ON	VO		-
	OFF	VF		
	The MINIMUM value is printed.	VL		
	The MAXIMUM value is printed.	VH		
	REF V STORE	VS□□□	□□□ indicates 3-digit numbers. Ex. 1. 0.5 Volt: VS 005 Ex. 2. 19.9 Volt: VS 199	

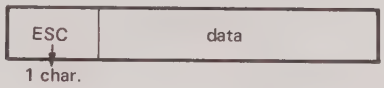
* When the control messages marked with an asterisk are received, measurement is stopped.

Table 3-4 ME462B RECEIVER control message (Cont'd)

Item			Code	Remarks	Refer to 3.2.3 (2)
DATA OUTPUT REQUEST			PM	The Receiver outputs the intermediate measurement and analysis data. When the printer mentioned below is in PRINT ON mode, the Receiver outputs concurrently the same data at the printer.	-
ERROR SECONDS	SYNCHRONOUS		DS		SW8
	ASYNCHRONOUS		DA		
PRINTER (option of ME462B Receiver)	PRINT	ON	PO	PRINT goes off automatically when control is changed from local to remote.	SW9
		OFF	PF		
	PAPER FEED		PP	Feeds one line by one command.	-
	NORMAL printing		PN		
	REVERSE printing		PR		
	MANUAL PRINT		PM	When PRINT is OFF, code PM is ignored. Output is also done at the RS-232C line when the PM code is received.	

3.2.3 Data Output

The ESC code (0001 1011: Decimal '27') precedes any data item. For details on the ESC code, refer to Section 3.3.3.

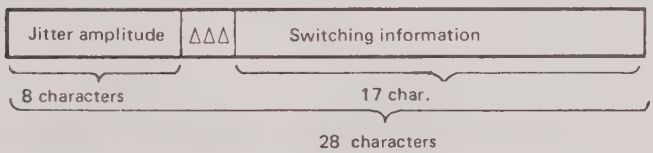


(Note) The number of Δ marks shows the columns to be blanked.

(1) Transmitter

(i) Output format

The output format is as follows:



- Jitter amplitude is output as follows:

  (a) When JITTER MODULATION is on:

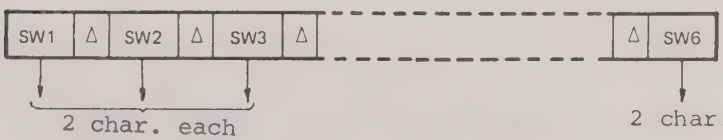
  [0.01 BIT Δ] to [9.99 BIT Δ], [10.0 BIT Δ] to [16.2 BIT Δ], [OVERFLOW] for 16.3 or more bits.

  (b) When JITTER MODULATION is set off:

  [- - - - - - - - -]

- Switching information is output as follows:

The codes in Table 3-3 are shown in the positions of SW n.



o Example of output format;

When
CLOCK	:	44.736 M
JITTER MODULATION	:	ON
FRAME	:	ON
PATTERN	:	PRBS
ERROR ADDITION	:	INTERNAL BIT
ERROR RATE	:	10^{-6}
DS-3 OUTPUT LEVEL	:	DSX-3
JITTER AMPLITUDE	:	14.2 BIT

[14.2BIT CI JO FO PA B6 OB]

(ii) Data output timing

- When [JITTER MODULATION] is set at [EXT] or [INT], data is output each time the jitter amplitude is measured (about 0.7 second) or when a switching is made (See Fig. 3-5).
- When [JITTER MODULATION] is set at [OFF], output is done only when any other switching is made.

In either case, an interrupt signal (ESC code: 0001 1011 : Decimal 27) is sent just before the data, so that the data can be known by monitoring the ESC code.

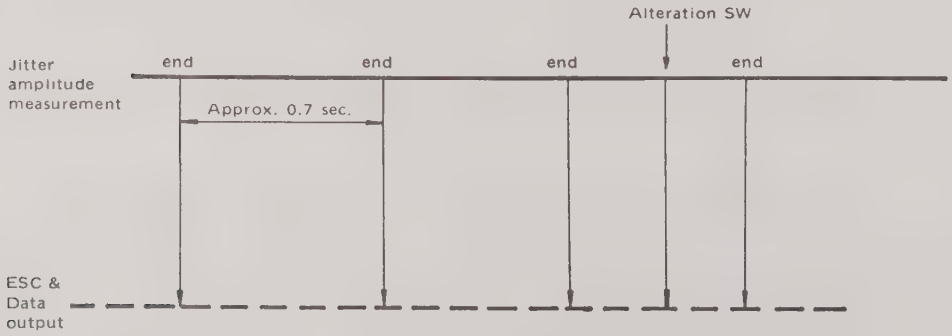


Fig. 3-5 TRANSMITTER Data Output Timing

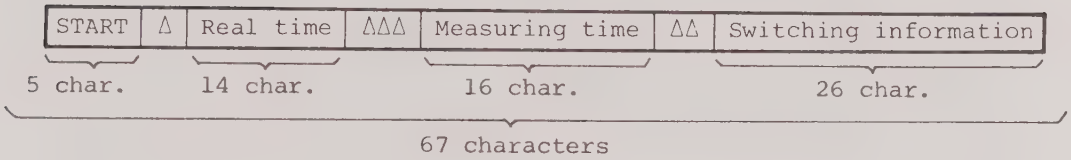
(2) Receiver

(i) Output format

There are 4 types of output formats as shown in following ① to ④.

① Measurement condition output

This is output when measurement starts.



- Real time is output as follows:

[SEP02/15 : 10 : 42]
Day Minute
Month Hour Second

- Measuring time is output as follows

(a) When measuring time is TIME:

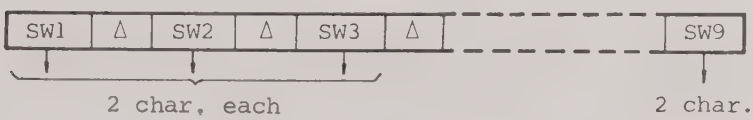
[TIMEΔ30 / 00 : 00 : 00]
Day Minute
Hour Second

(b) When measuring time is CLOCK:

[CLOCKΔE08ΔΔΔΔΔΔΔ] (example of 10^{+8})

- Switching information is output as follows:

The codes in Table 3-4 are shown in the positions of SW n.



o Example of output format;

When

REAL TIME	:	OCT 20/12:34:56
MEAS TIME	:	1 hr
INPUT	:	DSX-3
FRAME	:	ON
PATTERN	:	PRBS
MEASURING	:	REPEAT
CURRENT DATA	:	ON
MODE	:	OUT OF SERVICE
BUZZER	:	OFF
ERROR SECOND	:	SYNCHRONOUS
PRINT	:	OFF

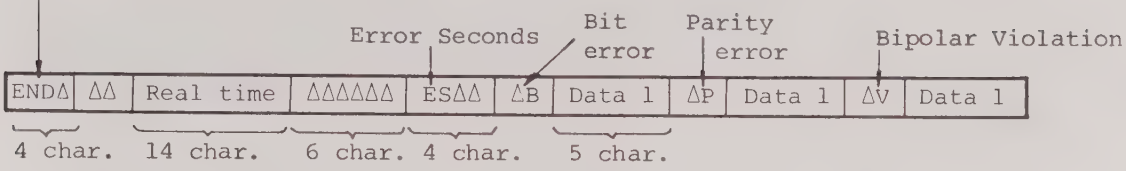
```
START OCT20/12:34:56   TIME 00/01:00:00  IB FO PA MR
                                (cont'd) CO SU BF DS PF
```

② Measurement and analysis data output

Output is done when a measurement is completed or when there is a request for data output (code is PM), and every two hours when the measuring time is set for up to 48 hours, or daily when the measuring time is set for over 48 hours.

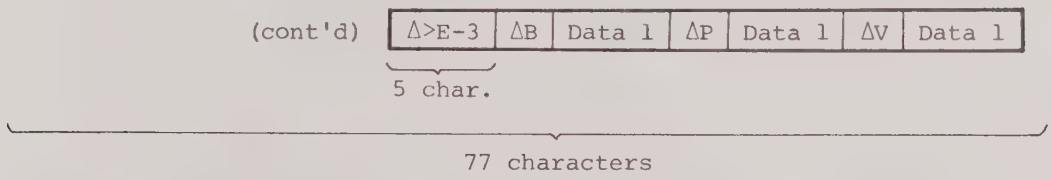
First line

ENDΔ or INT. (When measurement is ended: ENDΔ, Interim: INT.)

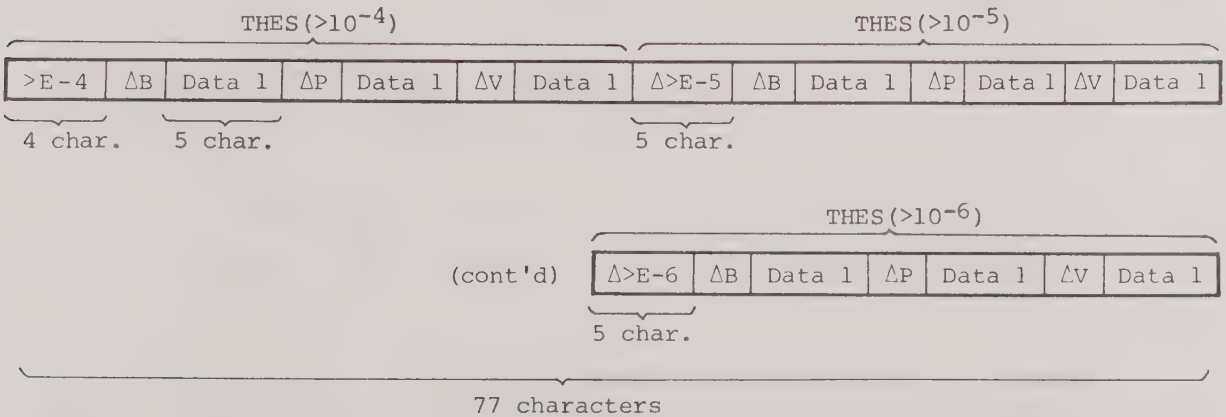


Threshold ES when the error rate exceeds 10^{-3}

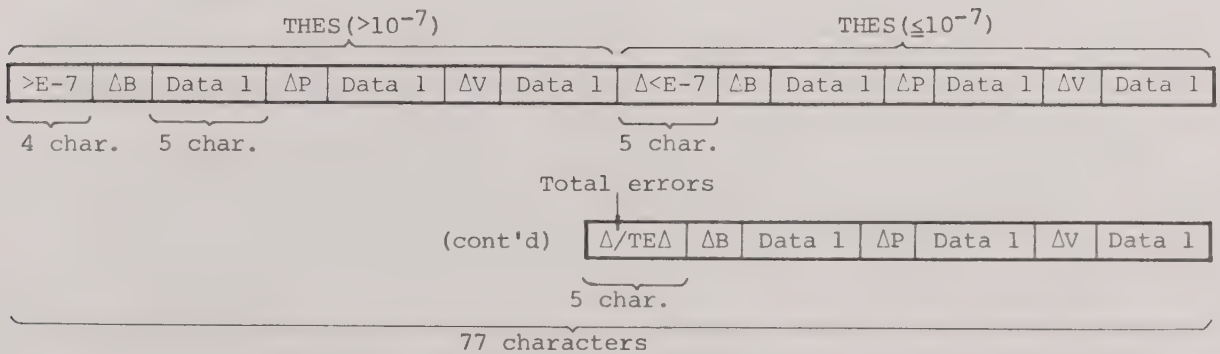
[Hereafter written in the form of THEFS($>10^{-3}$)].



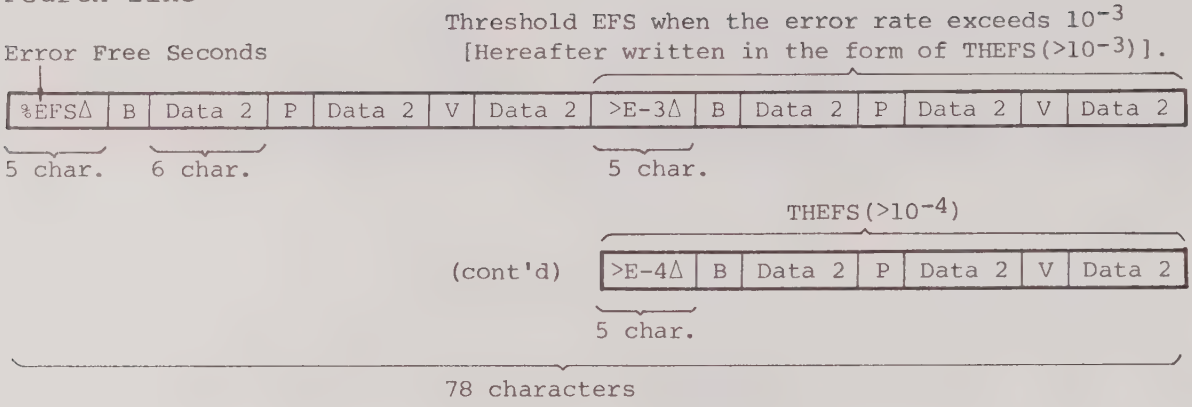
Second line



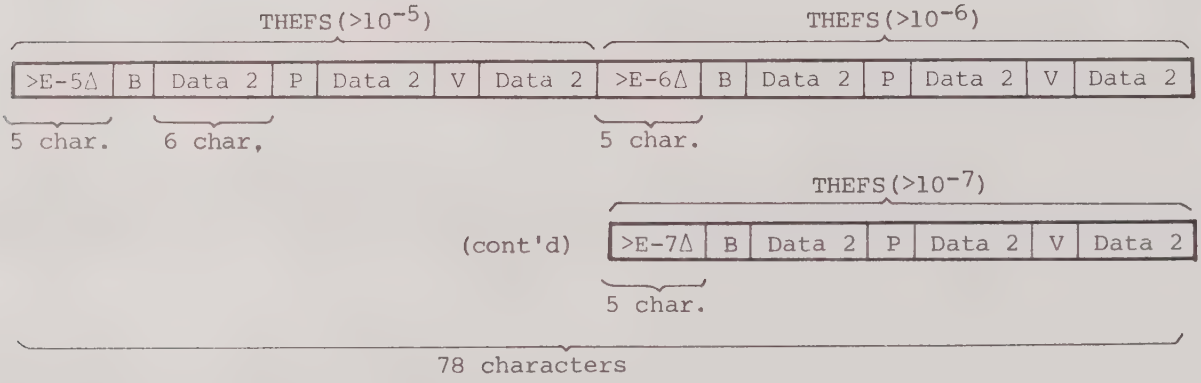
Third line



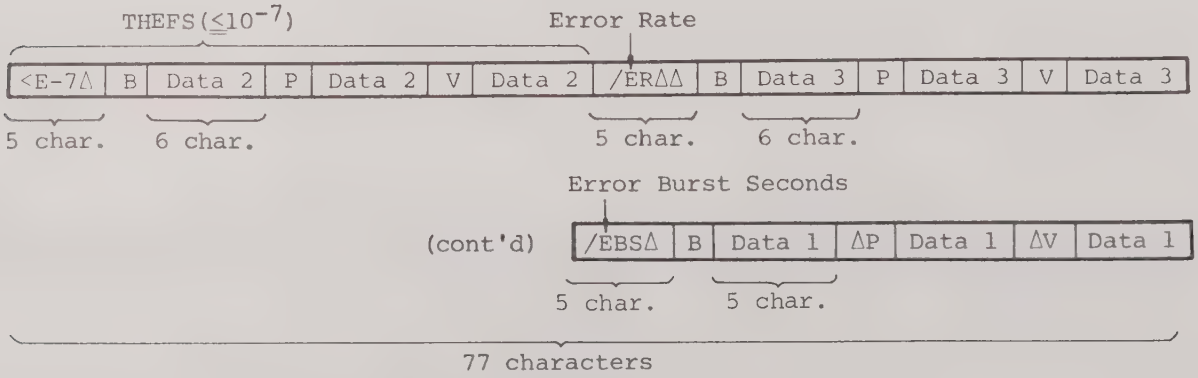
Fourth line


Error Free Seconds
Threshold EFS when the error rate exceeds 10^{-3}
[Hereafter written in the form of THEFS(>10^{-3})].
%EFSΔ | B | Data 2 | P | Data 2 | V | Data 2 | >E-3Δ | B | Data 2 | P | Data 2 | V | Data 2
5 char.
6 char.
5 char.
THEFS(>10^{-4})
(cont'd)
>E-4Δ | B | Data 2 | P | Data 2 | V | Data 2
5 char.
78 characters

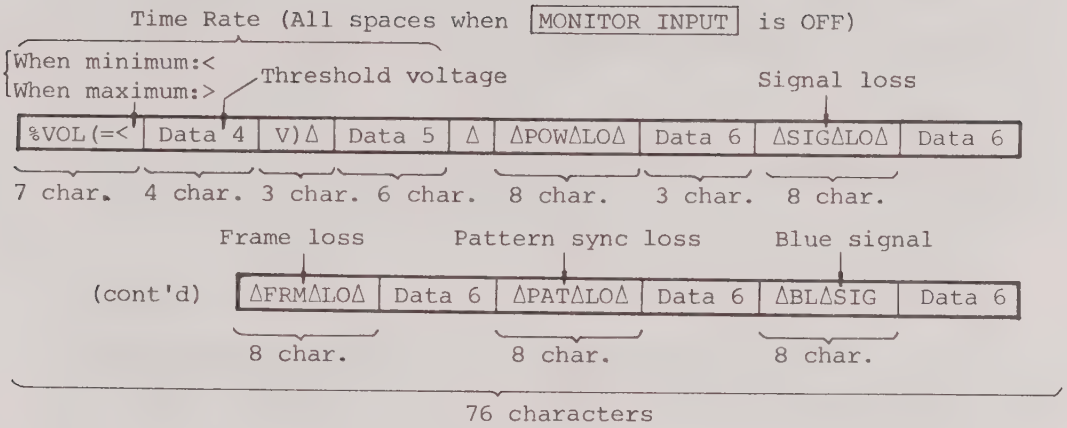
Fifth line


THEFS(>10^{-5})
THEFS(>10^{-6})
>E-5Δ | B | Data 2 | P | Data 2 | V | Data 2 | >E-6Δ | B | Data 2 | P | Data 2 | V | Data 2
5 char.
6 char.
5 char.
THEFS(>10^{-7})
(cont'd)
>E-7Δ | B | Data 2 | P | Data 2 | V | Data 2
5 char.
78 characters

Sixth line


THEFS(≤10^{-7})
Error Rate
<E-7Δ | B | Data 2 | P | Data 2 | V | Data 2 | /ERΔΔ | B | Data 3 | P | Data 3 | V | Data 3
5 char.
6 char.
5 char.
6 char.
Error Burst Seconds
(cont'd)
/EBSΔ | B | Data 1 | ΔP | Data 1 | ΔV | Data 1
5 char.
5 char.
77 characters

Seventh line



- Real time is output as follows:

  [SEP02 / 15 : 10 : 42]
  Day Minute
  Month Hour Second

- Data 1 is output as follows:

  [00000] to [99999] to [1.0 + 5] to [9.9+9]

  [ΔOFLΔ] for over 1.0×10^{10}

  However, the unmeasured errors are displayed as [-----].

- Data 2 is output as follows:

  [00.000] to [99.999] to [ΔΔΔ100]

  However, the unmeasured errors are displayed as [------].

- Data 3 is output as follows:

  [0.0-15] (example of 0.0×10^{-15})
  to [9.9-02] (example of 9.9×10^{-2})

  [ΔOFLΔΔ] for over 1.0×10^{-1}.

  However, the unmeasured errors are displayed as [------].

- Data 4 is output as follows:

  [Δ0.0] to [Δ0.1] to [20.0]

- Data 5 is output as follows:

  [00.000] to [99.999] to [ΔΔΔ100]

- Data 6 is output as follows:

  [000] to [999]
  [OFL] for 1000 or more

  However, the alarms not required for the measurement are displayed as [---].

o Example of output format;

First line

```
END   MAY01/10:00:00      ES   B00025 P00025
```

(cont'd)

```
V00026 >E-3 B00004 P00000 V00013
```

Second line

```
>E-4 B00006 P00006 V00015 >E-5 B00010 P00010
```

(cont'd)

```
V00017 >E-6 B00015 P00015 V00023
```

Third line

```
>E7 B00022 P00022 V00024 <E-7 B00003 P00003
```

(cont'd)

```
V00002 /TE  B1.3+6 P47438 V3.5+6
```

Fourth line

```
%EFS B99.942P99.942V99.939E>-3 B99.990P   100
```

(cont'd)

```
V99.969E>-4 B99.986P99.986V99.965
```

Fifth line

```
>E-5 B99.976P99.976V99.960E>-6 B99.965P99.965
```

(cont'd)

```
V99.946E>-7 B99.949P99.949V99.944
```

Sixth line

```
<E-7 B99.993P99.993V99.995/ER  B7.2-07P2.4-08
```

(cont'd)

```
V1.8-06/EBS B00013P00013 V 00021
```

Seventh line

```
%VOL(=< 0.7V) 47.516  POW LO 000 SIG LO 004
```

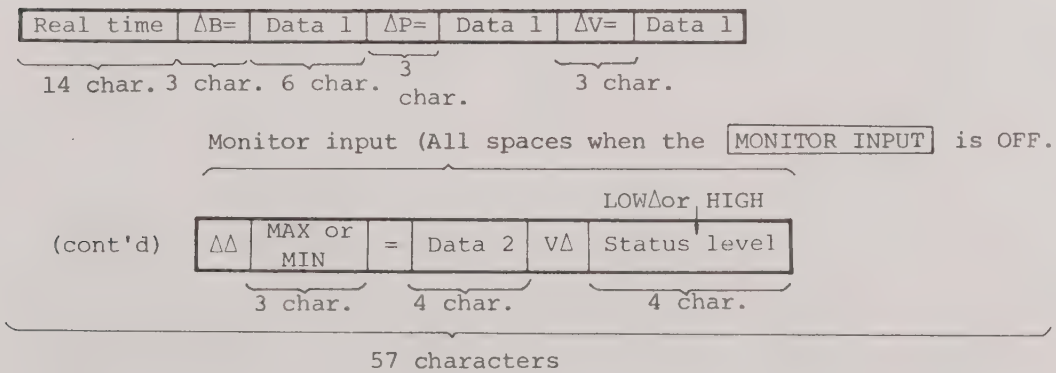
(cont'd)

```
FRM LO 000 PAT LO 002 BL SIG 000
```

③ Error outputs

Note that the error outputs, like the built-in printer (OPT 11), are controlled by the DIP switch on the rear panel (see Section 3.4.2(3) of ME462B (Main Frame) Operation Manual for details).

Also note that when the printer form save (see Section 3.4.2(2) of the above manual) is ON, up to 10 consecutive errors are output, but the 11th and subsequent errors are not output, which is similar to that of the printer. To output the 11th and subsequent errors, turn the form save switch OFF.



- Real time is output as follows:

  [SEP02/15:10:42]
  Month Day Hour Minute Second

- Data 1 is output as follows:

  [0.0-15] (example of 0.0×10^{-15})
  to [9.9-02] (example of 9.9×10^{-2})
  [ΔOFLΔΔ] for over 1.0×10^{-1}.

  However, the unmeasured errors are displayed as [------].

- Data 2 is output as follows:

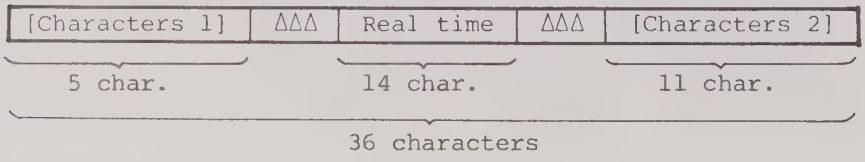
  [Δ0.0] to [20.0]

o Example of output format;

```
APR10/12:00:05 B=3.1-06 P=1.0-07 V=5.6-07  MIN=10.2V HIGH
```

④ Alarm data output

This data is output when an alarm occurs or when a recovery is made.



· [Character 1] are output as shown in Table 3-5.

Table 3-5 List of Characters 1 (5 char.)

Alarm	Occurrence	Recovery
Signal loss	NS1**	NS0**
Frame loss	FL1**	FL0**
Pattern sync loss	PL1**	PL0**
Blue signal	BS1**	BS0**

· Real time is output as follows:

[SEP02/15:10:42]
Day Minute
Month Hour Second

· [Character 2] are output as shown in Table 3-6.

Table 3-6 List of Characters 2 (11 char.)

Alarm	Occurrence	Recovery
Signal loss	SIGNALΔLOSS	SIGNALΔGAIN
Frame loss	FRAMEΔΔLOSS	FRAMEΔΔGAIN
Pattern sync loss	PATΔSYΔLOSS	PATΔSYΔGAIN
Blue Signal	BLUΔSIGΔDET	BLUΔNOTΔDET

o Example of output format;

Signal loss

At occurrence

```
NS1**   MAY15/10:21:40   SIGNAL LOSS
```

At recovery

```
NS0**   MAY15/10:21:42   SIGNAL GAIN
```

(ii) Data output timing

The timing for data output is shown in Fig. 3-6. The numbers ① to ④ in the figure correspond to the data of the four output formats explained in previous section 3.2.3 (2) (i).
Since an interrupt signal (ESC code: 0001 1011: Decimal 27) is sent out just before the data, the data can be known by monitoring the ESC code.

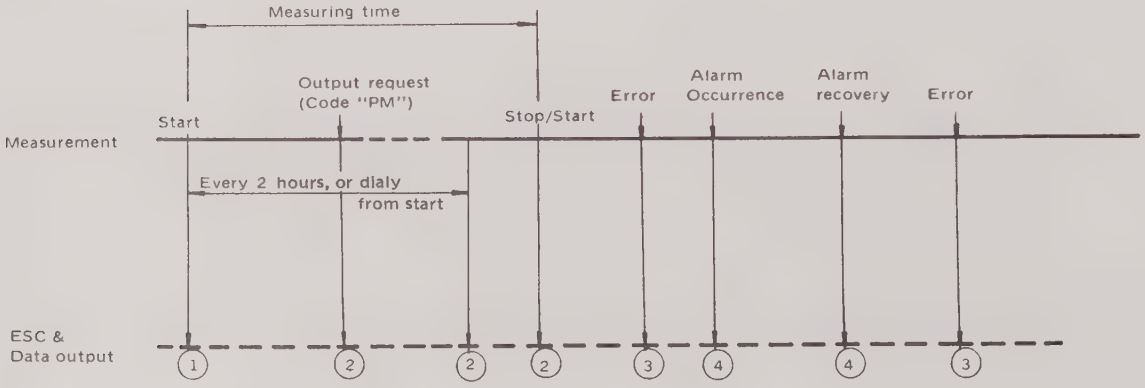


Fig. 3-6 RECEIVER data output timing

3.3 Measurement

An example of the ME462B control and the collection of measurement results performed by using a controller is shown below.

An explanation is made using Anritsu Packet II (with serial I/O interface DEU7773A) as the controller and its DPR7713A as the printer.

The select code of the ME462B Transmitter is set to [5] and that of ME462B Receiver is set to [7]. The RS-232C Interface must preset the presence of baud rate and parity in the controller. Besides, the RS-232C interface board of the ME462B must be set in the same conditions as controller.

Perform the setting of the RS-232C Interface board seeing "the settings rear panel and internal switches" shown in Section 3.2.1 as Tables 3-1 and 3-2.

Set Packet II as shown below.

```
SET @5:  HVAL ("Set point")
         select code
         for the TRANSMITTER.
         For the RECEIVER,
         Select Code
         changes to [7].
```

See the following figure

Set point

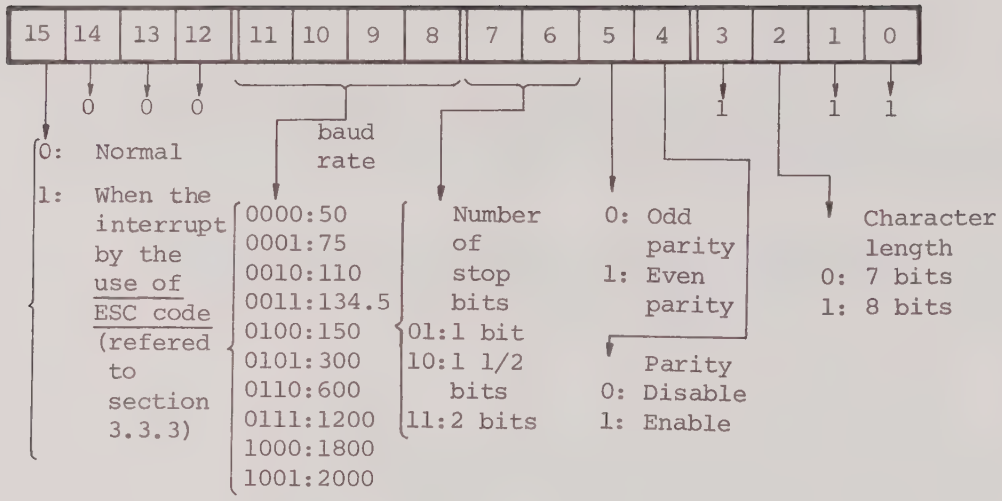
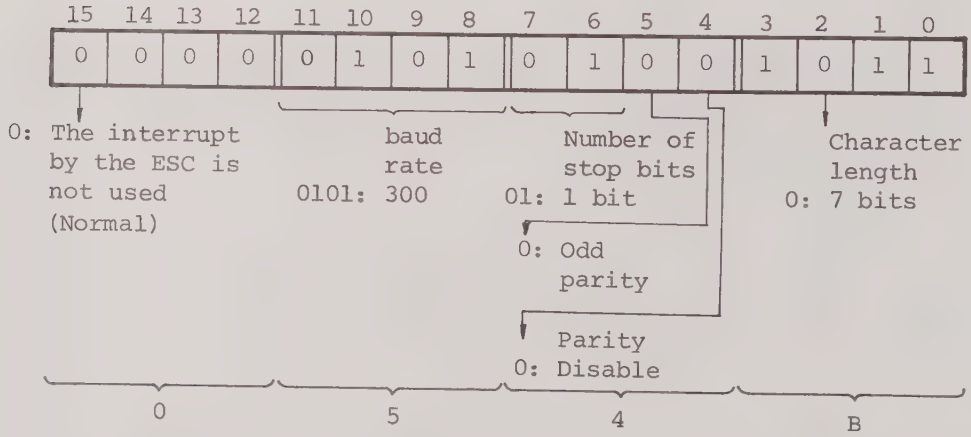


Fig. 3-7 Set point of the RS-232C Interface board

As an example, a setting example is shown when each of the switch setting for the RS-232C Interface board of the ME462B is initialized. (See the figure below.)


15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
0 0 0 0 0 1 0 1 0 1 0 0 1 0 1 1
0: The interrupt by the ESC is not used (Normal)
baud rate
0101: 300
Number of stop bits
01: 1 bit
0: Odd parity
Parity
0: Disable
Character length
0: 7 bits
0
5
4
B

SET @5: HVAL ("054B")

Note that if ac power failure occurs during measurement using the RS-232C interface and then the ac power is turned ON, the ME462B is set to local mode.

3.3.1 Examples for the setting

Example; For the setting the CLOCK in the transmitter to 44.736M:

```
WRITE @ 5:  "CI"
```

[5]; select code of the ME462B TRANSMITTER

For the transmitting two or more commands, mark them off by commas.

Example; For the setting the PATTERN in the receiver section to [PRBS] and the FRAME to [OFF]:

```
WRITE @ 7:  "PA, FF"
```

[7]; Select code of the ME462B RECEIVER

3.3.2 Examples for the data reading

```
READ @ 7: A$
```

Data is read in A$ in the character string format.

The following example program makes Packet II read a measurement result from the Receiver, and output the measurement result to the printer each time a measurement is completed:

```
10  DIM A$*100, B$*100
```

Specifies the maximum number of characters.

```
20  SET @7 : HVAL ("054B")
```

[7]; Select code of the ME462B RECEIVER.

054B; from set point with controller, Packet II (in previous page).

```
30  WRITE @ 7: "ST"
```

Start the measurement. (Refer to Table 3-4)

```
40  READ @ 7:  A$
50  B$ = A$ (2:100)
```
Deletes the ESC code from each data item. The ESC code is added to the head of each data item even if no ESC code interrupt is used.

```
60  WRITE @ 103:  B$
```
[03]; Address of the printer

```
70  GO TO 40
80  END
```

3.3.3 Program example

By using ESC code interrupts, the example program is illustrated for the Receiver as follows.

By using interrupts, the user can receive data from the ME462B and print it only when the ME462B outputs data, performing another job such as data analysis, drawing, or control of another measuring instrument.

```
10  SET @ 7: HVAL ("854B")
```
[7]; Select code of the ME462B RECEIVER

Note that the first values is 8 by (1000), not 0. This value specifies use of ESC code interrupts. (Refer to Fig. 3-7)

```
20  WRITE @ 7:  "IB, FO, PA"
```
Sets the switches.

```
25  WAIT DELAY 1
```
Inserts the delay time (1 sec) between the command "WRITE".

```
30  WRITE @ 7:  "DCL"
```
Resets the receiver to clear any stored measurement data from it. A lamp is tested for approx. 3 seconds.

```
35  WAIT DELAY 1
40  WRITE @ 7:  "ST"
```
The ME462B RECEIVER starts measurement. (refer to Table 3-4)

```
50  PROCESS EVENT SIO7 "@07, 03"
```
Defines the interrupt signal (ESC code)

```
60  START PSIO7
```
Enables the commands (200 to 270) used for interrupts.

```
70  CONNECT EVENT SIO7
```
Permit interrupts.
When an interrupt occures after this, the job skips to 200.

```
80  GO TO 80
```
If some expected commands are required, insert them at this position.

```
90  END
200 PARACT PSIO7 URGENCY 50
```
Declare the following commands as subroutine used for interrupts.

```
210 DIM A$*100, B$*100
220 WAIT EVENT SIO7
```
Waits for an interrupt occurrence. Command 80 is processed before an interrupt occurs. When an interrupt occurs, command 230 and the following commands are processed.

```
230 READ @ 7:  A$
240 B$ = A$ (2:100)
    Deletes the top ESC code from any input data
    item.
250 WRITE @ 103: B$
              ↑
            [03]; Address of the printer
260 GO TO 220
    Wait for the next interrupt
270 END PARACT
```

Note:
When the above example program is executed, Packet II usually executes the command on Line 80. Only when an interrupt is generated, it excutes the commands on Lines 230, 240, and 250. After these commands are executed, Packet II returns to Line 80 and continues execution of the command. When concurrently executing another job with this sample program, Packet II executes with the changed instruction to Line 80.

SECTION 4

PRINCIPLES OF OPERATION

The ME462B RS-232C interface employs the 8251A to convert data to serial data and control the signals. The 8251A is a serial data communications LSI called the Universal Synchronous/Asynchronous Receiver/Transmitter (USART).

Table 4-1 shows the ME462B RS-232C interface interchange circuit.

Table 4-1 Interchange circuit

Pin Number	Circuit	Description	Input/Output	Remark
1	AA	Protective Ground	——	
2	BA	Transmitted Data	Output	
3	BB	Received Data	Input	
4	CA	Request to Send	Output	Always ON
5	CB	Clear to Send	Input	
6	CC	Data Set Ready	Input	
7	AB	Signal Ground	——	
20	CD	Data Terminal Ready	Output	Always ON.

A cable used to connect the RS-232C interface to a controller differs from the one used to connect it to a MODEM. (The pin connections of the latter cable are shown in Fig. 2-1) This is because both the RS-232C and controller operate as the data terminal equipment. To connect the RS-232C interface to a controller, for example, a cable of which pin connections are shown in Fig. 4-1 needs to be used. The cable is used to connect the ME462B to the serial I/O interface DEU7773A of Packet II.

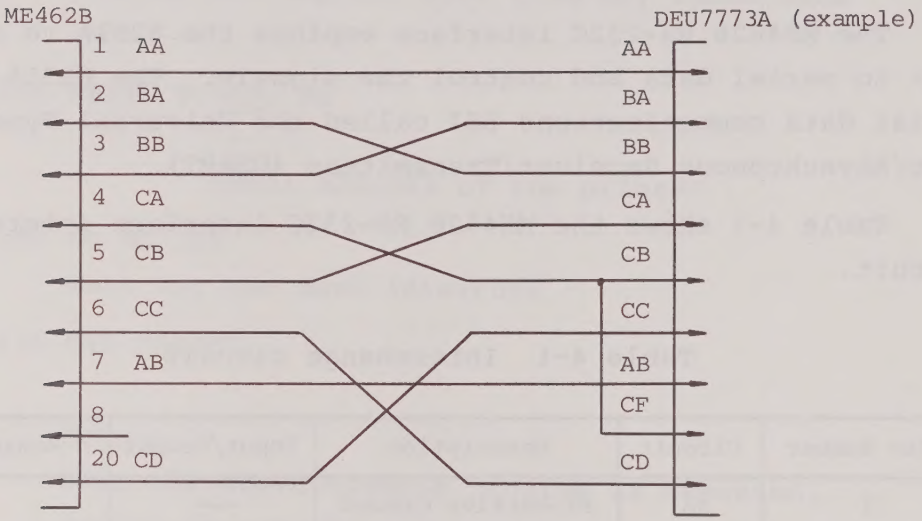


Fig. 4-1 Cable pin connections